COMPREHENSIVE REGIONAL AIR SYSTEM PLAN

A Report for Phases 1-3

November 2020

National Capital Region
Transportation Planning Board

COMPREHENSIVE REGIONAL AIR SYSTEM PLAN, PHASES 1-3 REPORT – NOVEMBER 2020
Prepared by the National Capital Region Transportation Planning Board (TPB) in cooperation with the Federal Aviation Administration (FAA). Oversight was provided by the Aviation Technical Subcommittee of the TPB Technical Committee.

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The National Capital Region Transportation Planning Board (TPB) is the federally designated metropolitan planning organization (MPO) for metropolitan Washington. It is responsible for developing and carrying out a continuing, cooperative, and comprehensive transportation planning process in the metropolitan area. Members of the TPB include representatives of the transportation agencies of the states of Maryland and Virginia and the District of Columbia, 23 local governments, the Washington Metropolitan Area Transit Authority, the Maryland and Virginia General Assemblies, and nonvoting members from the Metropolitan Washington Airports Authority and federal agencies. The TPB is staffed by the Department of Transportation Planning at the Metropolitan Washington Council of Governments (COG).

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The comprehensive Regional Air System Plan (RASP) Phases 1-3 Report captures all three phases of the multi-phase, multi-year planning process.

Phase 1 summarizes previous and recent air systems planning efforts, resulting in a determination of the state of the practice in regional air system planning. Phase 2 reviews existing conditions (supply) and anticipated needs (demand) in the regional airport system. The results of Phase 2 informed the airport-specific needs assessment and recommendations outlined in Phase 3.

All three phases were developed in conjunction with the National Capital Region's three commercial airports and the Federal Aviation Administration (FAA). All three phases will collectively constitute the updated RASP.

EXECUTIVE SUMMARY

In 1975, the Metropolitan Washington Council of Governments (COG) began the Continuous Airport System Planning (CASP) program with the landmark study, "The Future of Washington's Airports." Since the initial 1975 study, there has not been a fully comprehensive regional air system plan (RASP) update conducted. Rather, the CASP program has provided incremental updates over multiple plan volumes, along with a series of continual, smaller, incremental updates or amendments to the RASP.

Due to resource limitations, this RASP update has been prepared in three distinct phases, which resulted in this single comprehensive document at the end of the process. All three phases collectively constitute the updated RASP. Descriptions of the three phases are provided below:

- Phase 1 of the comprehensive RASP update is a review of previous and recent planning efforts and determination of the state of the practice in regional air system planning through a national literature review.

- Phase 2 contains a review of existing conditions (supply) and anticipated needs (demand) in the regional airport system. The specific areas of assessment in Phase 2 were determined by the work performed in Phase 1. The results of Phase 2 inform the airport-specific needs assessment and air system-wide policy issue recommendations outlined in Phase 3.

- Phase 3 consists of five key parts:

    - **Planning Considerations:** A comprehensive range of planning considerations that relate to the region's entire air system; not just ground access.

    - **Needs Assessments:** Needs assessments for BWI, DCA, and IAD aligned with supply and demand-based metrics outlined in Phase 2.

    - **Ground Access Element Update:** Provides the latest ground access forecast update and all proposed capital projects relevant to BWI, DCA, and/or IAD Airport connectivity within the long-range transportation plans of the Baltimore Metropolitan Council (BMC) and the National Capital Region Transportation Planning Board (TPB).

    - **Recommendations:** Set of ground access transportation planning recommendations based on findings from RASP Phases 1-3.

    - **Next Steps:** Proposed timeline for future RASP Updates.

As depicted in Figure 1 on the following page, the Washington/Baltimore air systems planning region stretches from Harford County, Maryland, on the Susquehanna River to the north, to Spotsylvania County, Virginia, to the south, and from the Chesapeake Bay in the east to the Shenandoah Valley to the west. This air systems planning region consists of 25 jurisdictions, 161 Aviation Analysis Zones, and 4,374 Transportation Analysis Zones.

Figure 1: Washington-Baltimore Air System Planning Region

Source: Metropolitan Washington Council of Governments, National Capital Region Transportation Planning Board

PHASE 1

Phase 1 of the comprehensive RASP update focused on a review of previous and existing RASPs, airport master plans, state aviation plans, and a national literature review to determine the state of the practice in regional airport system planning.

I. FEDERAL AVIATION ADMINISTRATION GUIDANCE ON REGIONAL AIR SYSTEMS PLANS

According to Federal Aviation Administration (FAA) guidance on the development of regional air systems plans, the role of metropolitan and/or regional planning organizations in the airport system planning process is determined by their legislative authority and the aviation expertise they possess. Typical agencies authorized to conduct these studies are Metropolitan Planning Organizations (MPOs), Councils of Government (COGs), and Regional Planning Councils or Commissions (RPCs). [1] These agencies are made up of representatives from local government and transportation authorities.

The geographic scope of an airport system planning process can include several adjacent states in a region, one individual state, or a specific metropolitan area. In the case of the Washington-Baltimore air systems planning region, the region does span beyond the COG-TPB metropolitan planning region to also include parts of the Baltimore Metropolitan Council (BMC) planning region, given the volume of individuals traveling in and out of the Washington Metropolitan Area who utilize BWI Airport. The variation in the roles of metropolitan planning organizations in airport system planning is even more pronounced than that of state agencies. Consultations between the local FAA Airport District Office, the state aviation agency, and local airports are needed to determine what role, if any, the regional or metropolitan planning organization will have in airport system planning for its region.

Metropolitan planning should not be considered a separate effort, but rather should complement the ongoing state airport system planning process, as is the spirit of this regional air system plan (RASP). Through airport advisory committees, individual airports should also participate in the metropolitan airport system planning process. Representatives of individual airports can identify issues, constraints, and opportunities at their airports and provide updates on the status of development projects.

Where metropolitan areas span several states, as is the case in the Metropolitan Washington Region, the regional planning agency should also consider the relationships among the various state airport system plans. Multi-state metropolitan systems are not always identified in individual state airport system plans; metropolitan planning studies can exist separately and should complement each state planning document, assisting with regional priorities for the state's recommendations. Surface transportation, airport access facilities, and land use impacts are important elements to consider in the metropolitan airport planning and project development process.

The most obvious distinguishing characteristic of an airport system planning process is its geographic scope. The scope of the plan can include several adjacent states in a region, one individual state, or a specific metropolitan area.

[1] U.S. Department of Transportation, Federal Aviation Administration, 2015. Advisory Circular 150/5070-7: The Airport System Planning Process. Washington, DC. https://www.faa.gov/documentLibrary/media/Advisory_Circular/150-5070-7-change1.pdf

II. WASHINGTON-BALTIMORE REGIONAL AIR SYSTEMS PLANNING REVIEW

The TPB has conducted a Continuous Airport System Planning (CASP) program since 1975 when the first grant application was approved by the Federal Aviation Administration (FAA). The goal of the CASP program is to provide a process that supports the planning, development, and operation of airport facilities and the transportation facilities that serve the airports in a systematic framework for the Washington-Baltimore region. The airport system planning process consists of a continuous cycle that begins with a regional air passenger survey. This survey is followed by forecasts of future air passenger travel and the ground travel of these air passengers to and from the region's three commercial airports. These forecasts in turn lead to the development of a revised ground access plan for the region.

The CASP program is developed, implemented, and monitored with the assistance of the Aviation Technical Subcommittee of the TPB's Technical Committee. The subcommittee is responsible for the coordination of airport system planning with the regional transportation planning process. The region's three major commercial airports are represented on the TPB by the Maryland Aviation Administration (MAA) and the Metropolitan Washington Airports Authority (MWAA). Although the TPB is the designated metropolitan planning organization (MPO) for the Washington metropolitan area, the air systems planning region included in its air system planning area consists of both the Washington metropolitan area as well as the Baltimore metropolitan area. As a result, TPB, through its Aviation Technical Subcommittee, coordinates its air systems planning process very closely with the Baltimore Metropolitan Council (BMC), the designated MPO for the Baltimore metropolitan area.

This section contains a review of the foundational as well as contemporary regional air systems planning-related studies conducted by COG-TPB and its regional planning partners. The summaries provided address each study's purpose, findings, and applicable recommendations.

THE FUTURE OF WASHINGTON'S AIRPORTS (1975, 1978)

In 1975 COG--TPB, in coordination with the Maryland Department of Transportation (MDOT), published The Future of Washington's Airports – A Proposed Plan for an Air Transportation System for the National Capital Region.

The purpose of the study was two-fold:

- To forecast commercial aviation activities for the Washington-Baltimore region to a horizon year of 2000 with appropriately proportional allocations of these demand forecasts to Baltimore/Washington International Airport (BWI; present-day Baltimore/Washington International Thurgood Marshall Airport), Washington Dulles International Airport (IAD), and Washington National Airport (DCA; present-day Ronald Reagan Washington National Airport).

- To consider commercial airport facility requirements on a regional scale, providing a general framework for individual airport planning.[2]

[2] "The Future of Washington's Airports." National Capital Region Transportation Planning Board, Metropolitan Washington Council of Governments, 1975, 1978.

Key recommendations addressed the following topic areas:

- Air Carrier Aviation Activity
- Recent Demographic and Economic Trends
- Air Carrier Airport Developments
- General Aviation Activity and Development
- Environmental Issues
- Continuing Air Transportation System Planning

WASHINGTON-BALTIMORE REGIONAL AIRPORT SYSTEM PLAN (1988-1997)

The first Washington-Baltimore Regional Airport System Plan (RASP) was conducted in three volumes from 1988 until 1997 by the Metropolitan Washington Council of Governments, in cooperation with the region's commercial airports and state departments of transportation.[3] The three studies, Volume I – Commercial Airports (1988), Volume II – Ground Access (1993), and Volume III – Air Cargo (1997) are synthesized in this section.

Volume I – Commercial Airports (1988)

At the time of the study's completion, air transportation in the Washington-Baltimore region had changed significantly since 1982 – most of which can be attributed to the effect of the 1978 deregulation of the U.S. airline industry. Within that brief window of time, the region's air service transitioned from one major, high-volume downtown airport (DCA) and two less-utilized suburban airports (BWI and IAD), to all three airports becoming fully used, providing high-quality air service to the major domestic markets. It was forecasted that the use of each of the three airports would continue to grow to the year 2000 and by then, both BWI and IAD would have passenger activity levels near or above those of DCA.[4]

Key Recommendations:

- **Airport Development:** Accommodate the forecasted growth with a call for the completion or update of airport master plans for BWI, DCA, and IAD.

- **Community Concerns:** Focus on Noise, Community Engagement, and Safety.

- **Interaction with Other Systems:** Conduct full intermodal coordination between the airports and highway and transit access facilities; Prioritize the development of facilities which improve transit accessibility to the airports; Consider full airport economic impacts when making airport policy decisions.

- **Future Regional Airport Planning:** Produce a regional general aviation plan to be updated on a minimum five-year cycle of activities; Develop a continuous regional air passenger survey; Prepare regional air passenger forecasts, comprehensive studies of airport ground access, and measure/forecast economic impacts of the region's airports on an ongoing basis.

[3] "Washington-Baltimore Regional Airport System Plan." National Capital Region Transportation Planning Board, Metropolitan Washington Council of Governments, 1988, 1993, 1997.
[4] "Washington-Baltimore Regional Airport System Plan, Volume I – Commercial Airports." National Capital Region Transportation Planning Board, Metropolitan Washington Council of Governments, 1988.

Volume II – Ground Access (1993)

Volume II of the Regional Airport System Plan was developed to address ground access to three major commercial airports in the Washington metropolitan area – BWI, DCA, and IAD. This effort approached the issue from a regional perspective, examining the total transportation system in the metropolitan area, and considering all major modes of access to the airports. The publication of this volume marked the initial attempt to consider airport ground access planning in the regional transportation context. Prior to Volume II – Ground Access, most ground access planning conducted was part of an individual airport's master planning process, or as a separate planning study.[5]

The study adapted the traditional four-step transportation planning modeling process (trip generation, trip distribution, modal split, and trip assignment) to incorporate and specifically focus on airport-related travel, thus allowing the impact of airport activity on the regional transportation system to be estimated. The results of this process provided the total volume, the level of service, the number of air passenger trips, the number of airport-work trips, and the number of airport-other trips for each link in the transportation network.

Study Approach:

- **Alternative Airport Access Scenarios:** Time series examining future demand in the years 2000 and 2010 with a base year of 1987.
- **Travel Time Analysis:** Travel times for each of the transportation analysis zones (TAZ) in the region to each airport.
- **Alternative Transit Scenarios:** Overview of the then-most recent evaluation of transit alternatives for the Dulles Corridor.
- **Air Passenger Access Satisfaction:** User satisfaction with airport access was evaluated by comparing distance and speed data to the scale of satisfaction.

Key Recommendations:

- **Highway Improvements:** Timely construction of airport-serving facilities in the Highway Element of the Long-Range Plan; Further study to determine needed improvements in the Dulles Airport Access Highway Corridor – as well as key highway and transportation improvements.
- **Transit Improvements:** Full pedestrian integration between Metrorail and the terminal improvements at DCA; Completion of the 103-mile Metrorail system; High-quality, quickly implementable transit service in the IAD Access Highway Corridor.
- **Paratransit Improvements:** Full integration of existing Washington Flyer service into the region's overall transit service program; Institution of shared ride door-to-door shuttle service via Washington Flyer; Study to assess the possibility of establishing a system of remote airport terminals; Regional taxicab licensing system to be studied for implementation at DCA.

[5] "Washington-Baltimore Regional Airport System Plan, Volume II – Ground Access." National Capital Region Transportation Planning Board, Metropolitan Washington Council of Governments, 1993.

- **Policy Recommendations:**

    - Preserve free-flow travel on the IAD Access Highway Corridor
    - Encourage airport employees to use high-occupancy modes of travel
    - Fully integrate the major commercial airports and all aspects of airport system planning into the regional transportation planning process
    - Fully incorporate the airport special generator modeling capability developed for the study into the regional transportation modeling process
    - Synchronize the cycles of the air passenger survey and airport ground access update with the regional Long-Range Plan
    - Receive a reliable, continuous source of funding from the Federal Aviation Administration for the Continuous Airport System Planning Program

Volume III – Air Cargo (1997)

Due to the overall growth in the amount of total air freight activity, both nationwide and within the region and the various calls for study in this area, Volume III – Air Cargo of the Washington-Baltimore Regional Airport System Plan was developed.[6] Leading up to the completion of this study, the total world-wide air cargo traffic had more than tripled between 1980 and 1995. In 1996, total U.S. air freight activity was estimated to grow from 39.2 billion pounds to 89.6 billion pounds by 2010. The intent of the study was to examine the existing and future demand for air cargo at BWI and IAD airports, and to analyze how the movement of this cargo affects the regional ground transportation network. The study examined the estimated potential demand for air cargo facilities and compared this demand with current and planned facilities to determine what air cargo facilities would be needed to meet future demand.

While the study concluded that the current level of air cargo-related vehicle traffic was insignificant compared with total airport vehicle traffic and traffic levels on major local and regional routes that thus would not have a significant impact on regional congestion or expansion requirements, it also cautioned that the projected increase in congestion on major access corridors in the metropolitan region could have a detrimental impact on the competitiveness of cargo services at both BWI and IAD due to increased access costs and diminished service levels relative to other airports.

Study Approach:

- **Regional Air Cargo Demand:** Projected to grow from 4.6 billion pounds (1996) to 20.1 billion pounds (2020); Consists of air freight and air mail which originates/terminates in the market region of BWI and IAD.

- **Regional Air Cargo Facilities:** Examined current and planned facilities, as well as an estimate of the capacity of the facilities and the air mail centers at BWI and IAD.

- **Regional Air Cargo Needs:** Estimated that an additional 1.2 billion pounds of air cargo capacity would be required by 2020, with horizons for expected shortfalls at BWI in 2017 and Dulles in 2011.

[6] "Washington-Baltimore Regional Airport System Plan, Volume III – Air Cargo." National Capital Region Transportation Planning Board, Metropolitan Washington Council of Governments, 1997.

- **Regional Network Analysis:** Concentrated on examining the effect that current and future vehicle traffic and congestion would have on truck traffic to and from the air cargo facilities; Examined the year 1997 as a base case and modeled scenarios for 2010 and 2020.

Key Recommendations:

- **Air Cargo Terminal Facilities:** Project planning for implementation of those facilities required to meet the projected shortfalls at BWI and IAD be undertaken in a timely manner

- **Efficiency Measures:** Examine potential measures, such as reduction in air cargo terminal use or more efficient use of truck services to inform timing of new facility developments.

- **Internal Access:** Analyze internal access systems at BWI and IAD to ensure the ability to accommodate congestion in and around air cargo terminal areas.

- **Road Layout:** Analyze layout of roads which serve the air cargo terminals in the immediate vicinity of BWI and IAD to ensure that they can accommodate large trucks.

- **Regional Collaboration:** Work together to identify financially beneficial opportunities to the region for improving access to the commercial airports in the Washington-Baltimore Region.

WASHINGTON NATIONAL AIRPORT NOISE COMPATIBILITY STUDY (1989)

The purpose of this study was to describe the 1989 DCA Noise Compatibility Study conducted in accordance with the provisions of Federal Aviation Regulation (FAR) Part 150. The study contains material developed in consultation with airport users, local jurisdictions, and interested individuals over a period of two years.[7]

Key Recommendations:

- **Noise Abatement Program:** Includes a noise abatement strategy, methods for reducing aircraft noise at source, restrictions on night operations, and overall operation procedures.

- **Land Use Compatibility Measures:**

    - Preventive Measures: Amending comprehensive plans and zoning maps to promote compatible land uses; Airport noise overlay zoning; Amending building codes to require soundproofing; Disclosing noise levels prior to contract for sale/lease; Establishing an airport noise information program.

    - Corrective Measures: Sound-proofing noise-sensitive public buildings; Constructing sound barriers.

[7] "Washington National Airport Noise Compatibility Study." Metropolitan Washington Airports Authority, 1989.

WASHINGTON-BALTIMORE REGIONAL AIR PASSENGER SURVEY

OVERVIEW

Simultaneous, regional surveys of air passengers at all three commercial airports (BWI, DCA, IAD) have been performed a total of 14 times to date - in 1973/74, 1981/82, 1987, 1992, 1998, 2000, 2002, 2005 and every two years since 2005. These surveys provide data which are essential for the airport system planning and master planning processes.

The Regional Air Passenger Survey is designed as an at-gate lobby interview survey. Interviewers distribute survey questionnaires to departing air passengers in the gate holding areas for pre-selected flights, and then collect the completed questionnaires as the passengers complete them or as the passengers are called to board their flight. Late arriving passengers are given a survey questionnaire with a postage paid mail-back envelope and are asked to fill in the questionnaire during their flight and return it by mail. In the 2013 survey, for the first-time, respondents also had the option of completing the survey online using a smartphone, tablet, or computer. The questionnaires ask travelers about the purpose of their air travel, how they traveled to the airport (drove, rode transit, etc.), and other information to support the airport system planning and airport ground access planning processes.

GENERAL FINDINGS REPORT (2017)

The General Findings Report of the 2017 Washington-Baltimore Regional Air Passenger Survey (APS) summarizes patterns of airport enplanement share, airport choice, airport preference, air trip purpose, ground trip origin, airport mode of access, air traveler characteristics, and at-airport use of facilities.[8] The report analyzes these data based on their geographic distribution.

Key Findings:

- **Airport Enplanement Share:** In 2017, 36.4 million passengers traveled through the Washington-Baltimore Region, an increase of seven percent from 2015 (34.1 million). Enplanement share by airport is broken down below.
    - 36 percent of passengers at BWI (up from 35 percent in 2015)
    - 33 percent of passengers at DCA (down from 34 percent in 2015)
    - 31 percent of passengers at IAD (the same as in 2015)
- **Airport Choice:** Survey respondents were asked to rank the three most important reasons (out of a list of nine) for choosing the airport they were departing from, of which closest airport and lowest airfare were the highest ranked.
- **Airport Preference:** For all air passengers (both residents and non-residents of the area), airport preference changed little between 2015 and 2017. In 2017 overall airport preference was distributed as follows: BWI (28 percent), DCA (41 percent), and IAD (15 percent). Sixteen percent expressed no preference.

[8] "Washington-Baltimore Regional Air Passenger Survey – General Findings Report, 2017." Metropolitan Washington Council of Governments, Transportation Planning Board, 2018. https://www.mwcog.org/documents/2018/06/29/washington-baltimore-regional-air-passenger-survey-airport-access/

- **Trip Purpose**
    - Locally originating air passengers reporting that they were traveling for non-business-related reasons declined from 63 percent in 2015 to 62 percent in 2017.
    - While non-business trips such as vacation declined from 28 percent to 24 percent, business-related trips overall increased from 37 percent in 2015 to 38 percent.
- **Ground Trip Origin:** While more definitive information is needed, it is possible that the following trends were at least partially due to increased usage of companies like Airbnb. Future surveys may be designed to gain further insights into this trend.
    - Between 2015 and 2017, air passengers beginning their trips from a private residence increased from 56 percent to 60 percent of total trip originations.
    - Air passengers beginning their trip to the airport from a hotel or motel saw a five percent decline between 2015 and 2017 - from 33 percent to 28 percent.
- **Mode of Access:** The region's most common mode of access to the airports continued to be the automobile (private, rental, taxicab, and transportation network companies [TNCs] such as Uber/Lyft), accounting for 84 percent of all local originations.
    - Of the 84 percent of trips accessed by automobile, taxicabs make up 11 percent (down from 15 percent in 2015) and TNCs make up 14 percent (up from 9 percent).
    - Metrorail usage by passengers traveling to DCA continues to be among the highest proportion of any airport in the country at 13 percent (up from 12 percent in 2015).
- **Air Traveler Characteristics**
    - Area residents accounted for 40 percent of the total departing air passengers. Non-residents accounted for the remaining 60 percent of departing air passengers.
    - Local originating passengers under age 25 increased from eight to nine percent. Passengers over 35 stayed decreased slightly from 73 to 72 percent.
    - Annual household incomes for passengers in the region continue to be higher than the regional median. In 2017, only 27 percent of the region's passengers had annual household incomes less than $80,000. More than half of both area residents (59 percent) and non-residents (53 percent) have an annual household income over $120,000.
- **At-Airport Use of Facilities:** Overall, 63 percent of departing passengers reported stopping for a boarding pass and/or bag check; 26 percent of whom utilized the e-ticket kiosk. When compared with 2015 findings, passengers who made a stop for a boarding pass and/or bag check increased at all three airports.

GEOGRAPHIC FINDINGS REPORT (2015)

This report summarizes findings regarding patterns of airport use, trip purpose, origin activity, mode of access, and household income; and analyzes these data based on their geographic distribution. The survey results are aggregated by Aviation Analysis Zone (AAZ), which are composed of aggregations of smaller TPB Transportation Analysis Zones (TAZs). AAZs are based on transportation geography, jurisdictional boundaries, major highways, and barriers to travel; they are relatively fixed zones, not intended to be adjusted due to demographic changes, and thus provide a consistent geographic basis to measure changes over time.[9]

Key Findings:

Airport Use

- Approximately 25.5 million air passengers originated in the Washington-Baltimore region in 2015, an increase of nine percent over the 23.4 million passenger originations in 2013.
- The total number of air passengers (including connecting passengers) increased by six percent between 2013 and 2015, from 32.3 million to 34.1 million.
- The total number of local originating passengers increased by nine percent between 2013 and 2015, primarily due to an 18 percent increase in those local originations traveling from the Virginia suburbs.

Trip Purpose and Origin

- In 2015, the percentage of locally originating passengers traveling for business increased to 36 percent, when compared with 32 percent in 2013. 27 percent of locally originating passengers indicated vacation as their trip purpose and 30 percent indicated personal or family affairs as their purpose.
- While 36 percent of air passengers originating in the Washington-Baltimore region were traveling on business, only nine percent of the total number of passengers left a place of business and traveled directly to the airport, same as in 2013.
- While over half of all air passengers left for the airport from a private residence, a significant amount (32 percent of the total) left from a hotel or motel.

Mode of Access

- For the Washington-Baltimore region overall, the most common mode of access to the airports in 2015 was a private car, accounting for 44 percent of locally originating air passengers, a slight decrease from 49 percent in 2013.

[9] "Washington-Baltimore Regional Air Passenger Survey – Geographic Findings Report, 2015." Metropolitan Washington Council of Governments, Transportation Planning Board, 2015. https://www.mwcog.org/documents/2016/11/16/washington-baltimore-regional-air-passenger-survey-geographic-findings-report-airport-access/

- Taxicabs were used by the second highest percentage (15 percent) of locally originating air passengers, followed by rental cars (14 percent).

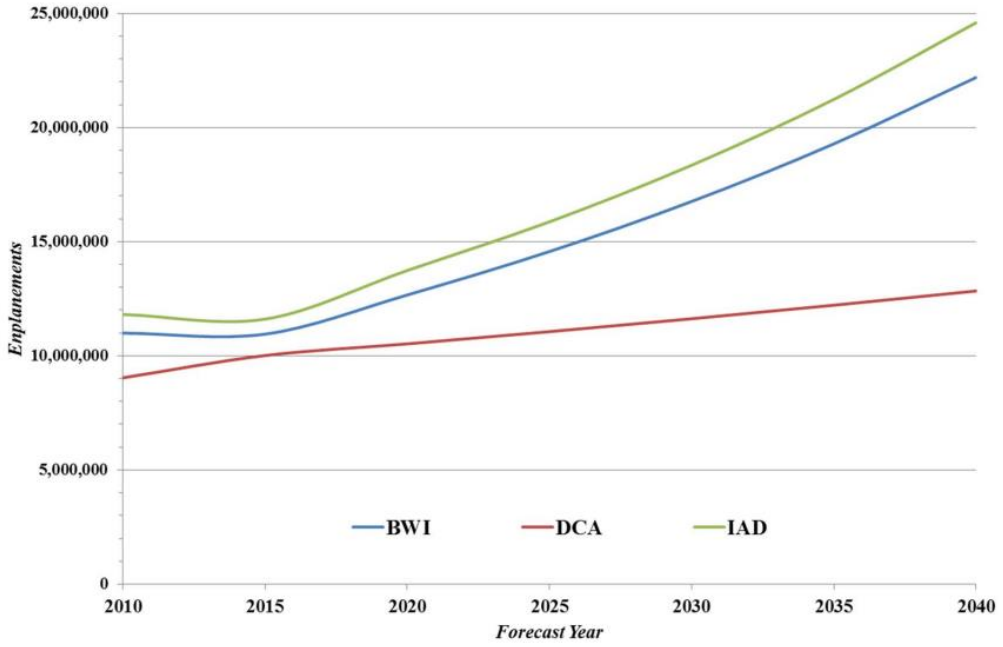
- TNCs such as Uber and Lyft, which were not an option for survey respondents in the 2013 survey, were used by nine percent of locally originating air passengers in 2015.

- Locally originating air passengers traveling to the airport by public transportation, such as Metrorail to DCA, or MTA light rail, MARC commuter rail, or Amtrak intercity rail to BWI, accounted for seven percent.

WASHINGTON-BALTIMORE REGIONAL AIR PASSENGER ORIGIN/DESTINATION FORECAST UPDATE (2013)

The Federal Aviation Administration (FAA) publishes Terminal Area Forecasts (TAF) of aviation activity for mainly FAA towered airports. While these forecasts are produced for passenger enplanements, they do not include ground access trip characteristics such origin/destination. However, origin/destination information is essential for airport-related transportation studies and for airport master plan landside facility determination. As a result, the Washington-Baltimore Regional Air Passenger Origin/Destination Forecast Update project developed an air passenger forecasting technique, based on the technique used in COG's Cooperative Forecasting program, and an airport origin/destination allocation based on a trip distribution model calibrated from the Air Passenger Survey data. This origin/destination data is then used to update airport ground access forecasts, which are then considered in the regional travel demand model.

Figure 2: Observed and Forecast Enplanements by Airport



Source: Washington-Baltimore Regional Air Forecast Update, 2013.

It should be noted that, although this report is dated 2013, it made use of the 2011 Washington-Baltimore Regional Air Passenger Survey (not the 2013 survey). This report documents the

procedures used to develop forecasts of locally originating air passenger trips from each regional aviation analysis zone (AAZ, TAZs, aggregations of TAZs) to each of the three major commercial airports in the Washington-Baltimore region.[10] According to the report, the COG/TPB Models Development program identifies the improvement of the representation of special traffic generators as an important component of the travel demand forecasting process.[11] COG/TPB has performed several special generator surveys in recent years, relating to military facilities, universities, tourist locations, and major shopping centers. The principal purpose of this forecast is to provide annual air passenger control totals to be used as an input to the regional travel forecasting process.

Key Findings:

The region's three airports are forecasted to have 59.6 million enplanements by 2040 - an increase of 87 percent from 2010. Domestic enplanements will experience a 75 percent increase between 2010 and 2040 to reach to 50 million. International destined enplanements are projected to more than double between 2010 and 2040 to 9.5 million. Figure 2 illustrates historical and forecast air passenger enplanements for the three airports in the Washington/Baltimore region.

WASHINGTON-BALTIMORE REGIONAL GROUND ACCESS TRAVEL TIME STUDY (2015)

The airport ground access travel time study analyzes travel time, changes in peak-period delay and level of service on principal airport-serving roadways from selected activity centers to the three commercial airports – and airport accessibility due to highway and transit improvements. Ground Access Travel Time studies were conducted in 1989, 1995, 2003, and 2011.[12]

Key Findings:

- Travel times to the airports, as measured by Travel Time Index (TTI) have not changed substantially from the 2011/2012 period to 2014/2015.

- Peak TTI

    - Peak TTI was observed for travel to DCA during midweek morning peak (6 - 9 AM).
    - Peak TTI to BWI was observed during weekday afternoon peak period (3 - 7 PM).
    - Travel to IAD was also during midweek morning peak, though not as high as to DCA.

- Use of new managed lanes that have opened since 2010 and certain HOV lanes can save time for travelers using the highway network to reach the airports.

    - The highest travel time savings were observed from Fredericksburg to IAD, at 25 minutes, using the 95Express and 495Express lanes during midweek morning peak.
    - Travel from Rockville to BWI saved about 20 minutes by using MD-200 (Inter-County Connector) instead of I-270 and I-495.

[10] "Washington-Baltimore Regional Air Passenger Origin/Destination Forecast Update, 2013." Metropolitan Washington Council of Governments, Transportation Planning Board, 2013. https://www.mwcog.org/assets/1/6/APOD_13_Final_July_2013.pdf, p. 1.

[11] Cambridge Systematics, Inc., "Fiscal Year 2010 Task Reports," Final Report (Washington, D.C.: National Capital Region Transportation Planning Board, November 16, 2010), http://www.mwcog.org/transportation/activities/models/review.asp, chap. 2.

[12] "Washington-Baltimore Regional Ground Access Travel Time Study, 2017." Metropolitan Washington Council of Governments, Transportation Planning Board, 2015. https://www.mwcog.org/documents/2017/01/18/washington-baltimore-regional-airport-ground-access-travel-time-study-airport-access/

- It is possible to reach all three airports by transit. Transit travel times ranged from about 16 minutes to reach DCA from downtown Washington, D.C. via Metrorail; 30 to 50 minutes from downtown Baltimore to BWI; to between 2 hours and 20 minutes and 3 hours and 30 minutes to reach the airports by way of transit from origins in Charles and St. Mary's Counties in Southern Maryland and Hagerstown, Washington County, Maryland.

- Congested highways continue to be a problem for travel to and between the three airports.

- The most congested parts of the region's highway networks include the Outer Loop of the Baltimore Beltway (I-695), both loops of the Capital Beltway (I-495) in Montgomery County and Fairfax County; I-270 and I-270 Spur in Montgomery County; the Baltimore-Washington Parkway in Anne Arundel County and Prince George's County; John Hanson Highway (US 50) in Prince George's County; the general purpose lanes of I-95 in Prince William County; the general purpose lanes of I-395 in Fairfax County, City of Alexandria and Arlington County; I-66 in Fairfax and Prince William Counties, DC 295, I-695 and I-395 in the District of Columbia.

WASHINGTON-BALTIMORE REGIONAL AIRPORTS AIR PASSENGER GROUND ACCESS FORECAST UPDATE (2013)

The Washington-Baltimore Regional Airports Air Passenger Ground Access Forecast Update presents detailed average weekday local originating air passenger ground access trips from 161 local area Aviation Analysis Zones (AAZ) to each of the region's three commercial airports.[13] The forecasts are further broken out by major ground access mode for each local AAZ to airport origin-destination pairs. These ground access forecasts are used as inputs for the update of the TPB's constrained element of the Visualize 2045 long-range plan and as the basis for revising the Ground Access Element of the CASP Regional Airport System Plan.

Key Findings:

- **Baltimore-Washington International Thurgood Marshall Airport:** Domestic destined enplanements at BWI are forecast to reach 21.6 million by 2040, an average annual increase of 2.4 percent, and international destined enplanements, with an average annual increase of 3.9 percent to 600,000 by 2040.

- **Ronald Reagan Washington National Airport:** At DCA, enplanements are projected to reach 12.8 million by 2040, an increase of 42 percent over 2010. Domestic enplanements are forecast to reach 12.7 million by 2040, from 8.8 million in 2010, an increase of 43 percent. International service at DCA under the perimeter rule is limited to eastern Canada and portions of the Caribbean islands. Total international enplanements at DCA are forecasted to decline by 27 percent from 158,000 in 2010 to 115,000 in 2040.

- **Washington Dulles International Airport:** Enplanements at IAD are projected to reach more than 24 million by 2040, double the 2010 volume. Domestic enplanements are forecast to reach 15.8 million by 2040, an average annual increase of 2.5 percent, and international destined enplanements, with an average annual increase of 3.7 percent to 8.8 million by 2040.

[13] "Washington-Baltimore Regional Airports Air Passenger Ground Access Forecast Update, 2013." Metropolitan Washington Council of Governments, Transportation Planning Board, 2013. https://www.mwcog.org/assets/1/6/GAFU-13-_Report-final_sept_2013.pdf

WASHINGTON-BALTIMORE REGIONAL AIR SYSTEM PLAN GROUND ACCESS ELEMENT UPDATE (2013)

The Ground Access Element of the Regional Airport System Plan provides an analysis of current and forecast ground access problems at BWI, DCA, and IAD airports. This plan element also integrates airport system ground access and facility planning into the overall regional transportation planning process and will include recommendations for improving ground access to the airports.[14]

Key Recommendations:

- **Maryland:** Widening sections of I-270, US 29, MD 28/MD 198, I-695, US 50, I-97, MD 5 and MD 210, as well as the construction of the I-95 Express Toll Lanes north of Baltimore are some of the highly recommended priorities for improving airport access, particularly to BWI.

- **Virginia:** Construction of the Tri-County Parkway, the widening of the Dulles Access Road and major sections of VA 28, the Loudoun County Parkway, VA 123, the Fairfax County Parkway, US 1 and the construction of High Occupancy/Toll (HOT) lanes on I-95 to connect with the 495 Express Lanes were some of the highly recommended priorities for improving airport access in the Northern Virginia portion of the region. Since the time of this study's completion, the Tri-County Parkway construction is no longer reflective of local plans, and the 95 Express Lanes have since been constructed.

WASHINGTON-BALTIMORE REGIONAL AIR CARGO STUDY (2015)

Airport cargo is a major element of airport system planning. This study examines existing demand and analyzes how the movement of cargo affects the regional ground transportation network. It also focuses on the goods movement portion of airport access, examines the estimated potential demand for air cargo facilities, and compares this demand with current and planned facilities to determine what air cargo facilities are needed to meet future demand.[15] The work is done in coordination with the programs of the Virginia Department of Aviation (DOAV), MAA, and MWAA.

Key Recommendations:

- **Congestion Alleviation:** Consideration should be given to the need to plan internal circulation systems and parking facilities in a manner that alleviates congestion in and around cargo facilities and improves truck access to and from cargo facilities.

- **Comprehensive Planning:** Airports should continue to incorporate air cargo needs into their comprehensive planning activities.

- **Regional Transportation Planning:** Airports should continue participating in the regional transportation planning process to ensure that ground access needs are identified and analyzed and that suitable ground access systems are planned and implemented.

- **Regional Collaboration:** Area jurisdictions should continue to work together to collaboratively identify financially beneficial opportunities for improving airport ground access in the region.

[14] "Washington-Baltimore Regional Air System Plan Ground Access Element Update, 2013." Metropolitan Washington Council of Governments, Transportation Planning Board, 2013. https://www.mwcog.org/assets/1/6/GAEU_Phase2_Report_Final_FAA.pdf

[15] "Washington-Baltimore Regional Air Cargo Study, 2015." Metropolitan Washington Council of Governments, Transportation Planning Board, 2017. https://www.mwcog.org/documents/2017/02/15/washington-baltimore-regional-air-cargo-study-airport-access-freight/

III. AIRPORT MASTER PLANS

An airport master plan is a detailed, long-term development plan for an individual airport.[16] Airport master plans are prepared to support the modernization or expansion of airports. As demonstrated in this section's summaries of the master plans for each of the region's three major commercial airports, the airport master planning effort involves collecting data, inventorying existing facilities, forecasting demand, determining facility requirements, evaluating alternative development plans, detailing long-range development plans and financial implementation schedules for a specific airport, and preparing an Airport Layout Plan (ALP).

The approved ALP is a key deliverable of the master planning process, serving as a record of aeronautical requirements, both current and future, and as a reference for local community deliberations on land use and zoning proposals as well as budget issues. The FAA requires all federally funded airports to have an FAA-approved ALP in place, which is typically updated and submitted to the FAA for approval every five years or as needed. The ALP should reflect an accurate depiction of existing and future proposed conditions in the airside, landside, and terminal areas, as well as proposed development over the near, interim and long-term planning horizons.[17]

According to a 2016 Washingtonian article – and as further articulated in the Washington-Baltimore Regional Air Passenger Survey 2017 General Findings results below – it's a close race for passengers among the region's three airports, with all three planning major upgrades in order to attract more air passengers and improve the airport experience, from the security checkpoints to the food court.[18] Many of these changes are reflected in the airport master plan descriptions within this section.

In 2017, 36.4 million passengers traveled through the Washington-Baltimore Region, an increase of seven percent from 2015 (34.1 million).[19] This total is broken down by the percentage of passengers at each airport:

- 36 percent of passengers at BWI (up from 35 percent in 2015)
- 33 percent of passengers at DCA (down from 34 percent in 2015)
- 31 percent of passengers at IAD (the same as in 2015)

[16] "Advisory Circular: The Airport System Planning Process." U.S. Department of Transportation Federal Aviation Administration, 2015.
[17] "Recommendation to Approve an Update to the Airport Layout Plan for Ronald Reagan Washington National Airport." Metropolitan Washington Airports Authority, 2017. http://www.mwaa.com/sites/default/files/BOD/2017-01/tab_5_recommendation_to_approve_an_update_to_the_airport_layout_plan_for_ronald_reagan_washington_national_airport.pdf
18 "Future of DC Airports – New Construction DCA BWI IAD." The Washingtonian, 2016. https://www.washingtonian.com/2016/11/21/future-of-dc-airports-new-construction-dca-bwi-iad/
19 "Washington-Baltimore Regional Air Passenger Survey – 2017 General Findings." National Capital Region Transportation Planning Board, Metropolitan Washington Council of Governments, 2018.

BALTIMORE/WASHINGTON INTERNATIONAL THURGOOD MARSHALL AIRPORT (BWI)

Consolidated Transportation Program (2018 – 2023, 2019–2024)

In 2017, a record 26.3 million enplaning air passengers flew through BWI – 1.4 million more than the previous year. To accommodate the airport's growth, the Maryland Aviation Administration (MAA) continues improving its facilities and passenger amenities, as outlined in the forthcoming Maryland Department of Transportation Consolidated Transportation Plan 2019 - 2024 (MDOT CTP).[20]

Following the installation of a new International Checked Baggage Inspection System in 2017, a six-gate expansion of the International Concourse will open to the public in fall 2018, enhancing Customs processing for arriving travelers. Reconstruction of 28,000 square yards of concrete apron pavement surrounding Concourse B is underway and the design of a five-gate extension to Concourse A is nearing completion. In early 2019, construction will begin on the 55,000 square foot, five-gate extension to Concourse A, which serves Southwest Airlines. This is an important first step in a multi-year upgrade to Terminal A/B, which is the center of operations for Southwest Airlines at BWI.

Over the past year, BWI air cargo activity grew by approximately 60 percent. The airport responded to this rapid growth with a fast-track construction project, expanding the Midfield Cargo Apron with three new aircraft parking positions – for a total of six – to accommodate growth by an existing carrier in time for peak 2017 holiday season demand.

At BWI, airlines need to perform periodic or incidental maintenance on their aircraft. Currently there is insufficient space at the airline gates or within the terminal and adjacent areas for airlines to perform aircraft maintenance functions. The forthcoming creation of an Aircraft Maintenance Facility will support aircraft maintenance needs.[21]

With support from the Maryland Department of the Environment (MDE), MAA procured twenty new articulated shuttle buses powered by clean natural gas (CNG) for transportation between the BWI terminal and the consolidated rental car facility. For those travelers seeking the highest level of convenience, "concierge-style" valet parking was launched in the hourly garage in early 2018.

Environmental Assessment of Airport Layout Plan Phase 1 (2016–2020)

In April of 2015 the FAA conditionally approved the Airport Layout Plan (ALP) for BWI. The 2015 ALP identified three phases of improvements at BWI, which are key to meeting FAA design standards as well as the airport's own capacity demands. Phase 1 (2016-2020) is the primary element of the ALP under consideration in the Environmental Assessment and Section 4(f) Determination recently undertaken by the Office of Environmental Services at MAA.[22] The purpose of each element of Phase 1 and its associated projects are outlined below:

[20] "Draft Consolidated Transportation Program 2019 to 2024." Maryland Aviation Administration, Maryland Department of Transportation, Publication forthcoming: 2019.
[21] "Consolidated Transportation Program 2018 to 2023." Maryland Aviation Administration, Maryland Department of Transportation, 2018.
[22] "Proposed Improvements 2016-2020 at Baltimore/Washington International Thurgood Marshall Airport: Draft Environmental Assessment and Draft Section 4(f) Determination." Office of Environmental Services, Maryland Aviation Administration, Maryland Department of Transportation, 2018. http://www.marylandaviation.com/_media/client/environmental/2018/Draft_EA_and_Section4(f)_Determination_Proposed_Improv_2016_2020_BWI_v2.pdf

Meet FAA Design Standards

- Improve taxiway fillets/shoulders in the International Terminal Area
- Construct new infill pavement near Taxiways T, P and 'Future P' (Runway 4-22 has been converted to Taxiway P but was previously referred to as Future P)
- Relocate Taxiway K and Re-establish Taxiway L
- Relocate Taxiways R and F
- Relocate Taxiway V
- Expand Runway 28 Deicing Pad
- Remove Part 77 Obstructions: for on airport property clear the primary, approach (50:1) and transition surfaces; for off-airport properties clear to the threshold siting surface (34:1)
- Clear trees in the VORTAC critical area to a 1,200-foot radius

Enhance Airfield Safety and Efficiency

- Construct Taxiway U3
- Relocate Taxiway H
- Construct Isolation/ Remain Overnight (RON) Apron
- Construct Northwest Quadrant Perimeter Road
- Construct vehicle service roadway (VSR) connector south of the former Runway 4 end
- Expand existing ARFF indoor parking
- Relocate fire training facility
- Rehabilitate/improve pavement in accordance with the latest Pavement Management Plan

Accommodate Existing and Anticipated Demand

- Expand Runway 15R Deicing Pad
- Construct Second FBO
- Construct new Northrop Grumman Hangar
- Construct new airline maintenance facility
- Increase runway deicing chemical storage and construct access road
- Building 113 Demolition
- Relocate and consolidate airport maintenance complex

Improve Customer Service

- Construct new Sky Bridge C
- Widen terminal roadway
- Widen upper level roadway at Concourse E

NEPA Review of Previously Acquired Property

- Perform NEPA review of acquired parcel located at 1143 Stoney Run Road

RONALD REAGAN WASHINGTON NATIONAL AIRPORT (DCA)

Reagan National Project Journey

The current facilities at Ronald Reagan Washington National Airport (DCA) were designed to serve 15 million enplaning passengers per year. However, 23.9 million enplaning passengers traveled through the airport in 2017, setting new records and straining the existing infrastructure. To accommodate this level of passenger traffic and provide an improved level of service, a series of projects are underway.

Project Journey is a $1 billion major development program that includes two key projects: new security checkpoints and a new concourse. The program is estimated to be completed in 2021.[23]

New Concourse

The new concourse will replace the 14 hardstand gates currently accessed via bus from Gate 35X. Contact gates with enclosed access to planes via jet bridges, spacious hold rooms, new concessions and an American Airlines Admirals Club lounge will be provided. The facility will increase safety and security, as well as enhance passenger convenience. It will end the need for travelers to ride buses from the terminal to board regional jets parked outside. The concourse design includes architectural features consistent with Terminal B/C's exposed metal beams, glass walls and domed ceilings while maximizing open, navigable gate areas and panoramic views of downtown Washington, D.C.

New Security Checkpoints

The new security checkpoints will be conveniently located between National Hall and walkways from the Metrorail station and parking garages. Upon activation, the new 50,000 square foot checkpoints will expand screening capacity from 20 to 28 security lanes and create a seamless, free-flowing environment between Terminal B/C (Gates 10-45).

By relocating the existing security checkpoints, passengers will be able to move freely between gate areas and enjoy all the amenities the airport offers without having to be re-screened. The resulting terminal reconfiguration will provide passengers an improved post-security experience — alleviating gate area congestion while expanding access to a variety of shopping, dining and seating options. The two new security checkpoints will be built above the existing arrivals roadway.

Airport Capital Improvement Plan, DCA Airport, 2019 –2023

In addition to Project Journey, various airfield improvements are underway or planned. A pavement rehabilitation project for various taxiways and Runway 4/22 is nearing completion. Expansion of Hold Bay 04 including deicing collection and storage facilities is scheduled to begin in October 2018.

Planned airfield improvements in the Airport Capital Improvement Plan (ACIP) for Reagan National Airport include taxiway geometry projects to meet FAA standards and reduce the likelihood of runway incursion, hold bay reconfiguration, and pavement rehabilitation projects. Detailed projects by year are provided below.

[23] "Reagan National Project Journey." Ronald Reagan Washington National Airport, 2018. **http://flyreagan.com/dca/project-journey**

Air Capital Improvement Plan Projects Listed by Year:

2019

- **Construct Taxiway, J, A, C, E** (South Airfield Geometry Improvements TV-900 Electric Vault Relocation – Phase I): The relocation of the TV-900 electrical Vault is an enabling project to allow for the reconfiguration of Hold Bay 01. The project will also increase the resiliency of the vault at the south end of the Airport.

2020

These pavement rehabilitation projects are part of the ongoing pavement management program:

- **Rehabilitate Taxiways J, M, N, and N1**
- **Rehabilitate Taxiway and Apron – South GA Apron & Taxiway Papa West**

2021

- **Construction Taxiway J, A, C, E** (South Airfield Geometry Improvements Taxiway and RWY 01 Hold Apron – Phase 2): Includes the reconfiguration of the Runway 01 hold bay to meet FAA standards. In addition, the project includes deicing collection and storage facilities.

- **Expand Runway 15 Hold Bay and Rehabilitate Runways 15 and 22 Hold Bays:** Will reconfigure the Runway 15 hold bay to increase efficiency at the north end of the airport. It is also part of the ongoing pavement management program.

2022

- **Construct Taxiway J, K, N** (RIM and Hot Spot 2 Taxiway Geometry Improvements Taxiway and Hold Apron and Relocate N Phase 1): Will address the non-standard taxiway geometry associated with the FAA identified Runway Incursion Mitigation (RIM) location (Runway 19 hold bay) and Hot Spot 2. The project will meet taxiway design standards and help to decrease the likelihood of runway incursions. Runway guard lights will also be installed at Hot Spot 2 to increase pilot situational awareness.

2023

- **Relocated Taxiway N Phase II:** This project is to comply with the runway to taxiway separation distance between Taxiway N and Runway 15/33.
- **Rehabilitate Apron – Terminal B/C Ramps:** Part of ongoing pavement management program
- **Rehabilitate Apron – Terminal A Apron:** Part of ongoing pavement management program

Airport Layout Plan

The Airport Layout Plan (ALP) for Reagan National was approved by the MWAA board in January 2017 and was approved by the FAA in 2018. The update incorporates all Runway Safety Area work that was completed in previous years and all pen and ink change approvals since the last update (2012), including the Project Journey new concourse and checkpoints. New development items include the revision of planned roadway improvements, associated enabling projects (new Engineering and Maintenance Shops Building and temporary parking structure) and airfield improvements to address the Runway Incursion Mitigation (RIM)/ Hot Spot nonstandard taxiway geometry, Runway 04 Hold Bay expansion and Runway 01 Hold Bay improvements.

WASHINGTON DULLES INTERNATIONAL AIRPORT (IAD)

Airport Capital Improvement Plan, IAD Airport, 2019 – 2023

Washington Dulles International Airport served over 22.7 million enplaning passengers in 2017, a 4.1 percent increase over the previous year. The increase was largely due to the addition of new International Airlines and destinations. This trend is anticipated to fuel continued growth in 2018. Many of the current projects at Dulles are for maintenance and/or enhancement of existing facilities. Near-term capital improvements consist of upgrades to existing concourses that will extend their useful life. Projects range from new roofing to electrical, plumbing, and new finishes. Other improvements consist of aircraft fueling system upgrades, pavement rehabilitation for aircraft parking aprons, taxiways, taxi lanes and runways, and baggage system upgrades to provide additional capacity. A small number of additional narrow body aircraft gates are envisioned that will enable existing gates to be converted to accommodate widebody aircraft.

In addition, MWAA continues to rehabilitate the pavement at the airport as part of the ongoing pavement management program and bring the airfield up to Aircraft Design Group (ADG) VI and Taxiway Design Group (TDG) 7 standards. Rehabilitation of a portion of Taxiway J and Taxi-lane B west section rehabilitation and widening are anticipated to be completed this fall. Additional airfield pavement rehabilitation projects planned are listed below.

Air Capital Improvement Plan Projects Listed by Year:

2019

- **Reconstruct & Wide Taxi-lane B, Middle, Section 2:** Will widen Taxi Lane B to 84 feet to meet TDG-7 standards; will be the final phase of the Taxi Lane B rehabilitation and widening.

2020

- **Reconstruct North Runway 1C-19C & High-Speed Taxiways:** Will rehabilitate original pavement on the northern portion of the Runway 1C/19C. Note the southern portion of the runway was rehabilitated several years ago.

2021

- **Reconstruct Runway 1R-19L (Phase 1 Design):** This project is for the design of a complete rehabilitation and widening of the Runway 1R/19L. The original pavement panels will be replaced, and the runway widened to 200 feet to accommodate Design Group VI aircraft.

- **Reconstruct Apron B Gates, SE End, Sections 3 & 4:** This project is part of the ongoing pavement management program.

2022

These projects are part of the ongoing pavement management program:

- **Reconstruct Apron B Gates, SW End, Sections 1 & 2**
- **Reconstruct Taxiway Y Section 5**

2023

- **Reconstruct Taxi Lane A:** Part of the ongoing pavement management program.

Dulles Corridor Metrorail Project: Section 106 Activities Annual Report

In 2017, the Metropolitan Washington Airports Authority (MWAA), and a number of local stakeholders - including the Virginia Department of Transportation (VDOT), the Washington Metropolitan Area Transit Authority (WMATA), Fairfax County, Loudoun County, and the Virginia Department of Rail and Public Transportation (DRPT) -- continued planning, development, design and construction activities for the Project, a 23.1-mile extension of the regional Metrorail system along the rapidly growing Dulles Corridor in Fairfax and Loudoun Counties.[24] The Project extends the 106-mile Metrorail system existing in 2007 from the Metrorail Orange Line in Fairfax County through Tysons Corner to the Washington Dulles International Airport (Dulles Airport) and beyond to Route 772 in eastern Loudoun County. Most of the extension is being constructed in the median of the Dulles Connector Road, the Dulles International Airport Access Highway (DIAAH), and the Dulles Greenway toll road, but the alignment also diverts off median to directly serve Tysons Corner and Dulles Airport. The entire extension, once completed, will include 11 new Metrorail stations, a maintenance and storage yard on Dulles Airport property, and an expansion of the existing service facilities at the West Falls Church Station. Four of the new stations are located within Tysons Corner because it offers the significant ridership potential with the least impact on residential areas.

The Project's first phase, known as the Extension to Wiehle Avenue, completed the initial 11.7 miles of the planned extension from the current Metrorail Orange Line to Wiehle Avenue in Reston. The alignment follows the Dulles Connector Road, Route 123 and Route 7 in Tysons Corner, and the DIAAH. The Extension to Wiehle Avenue includes five new stations (McLean, Tysons Corner, Greensboro, Spring Hill, and Wiehle-Reston East), additional commuter parking, improvements to the existing Metrorail Service and Inspection Yard at West Falls Church, and an interim terminus at Wiehle Avenue. Construction was substantially completed in spring 2014 and revenue operations of the Extension to Wiehle Avenue commenced on July 26, 2014.

The Project's second phase, known as the Extension to Dulles Airport/Route 772, will complete the Project from the Phase 1 terminus at Wiehle Avenue to Route 772 in Loudoun County. From Wiehle Avenue, the alignment will continue along the DIAAH, cross Dulles Airport property, and then follow the Dulles Greenway to the terminus at Route 772. The Extension to Dulles Airport/Route 772 will include six additional stations (Reston Town Center, Herndon, Innovation Center, Dulles Airport, Loudoun Gateway, and Ashburn), additional commuter parking, and a new Service and Inspection Yard on Dulles Airport property. Revenue operations of the Extension to Dulles Airport/Route 772 is tentatively scheduled for some time in 2020.

Airport Layout Plan

The Airport Layout Plan for Dulles was last updated in July 2016. It included property boundary changes and various projects that were recently completed or planned.

[24] "Dulles Corridor Metrorail Project: Section 106 Activities Annual Report." Metropolitan Washington Airports Authority, 2018. http://www.dullesmetro.com/silverline/assets/File/project_docs/2017%20Section%20106%20Activities%20Annual%20Report%20-%20FINAL.pdf

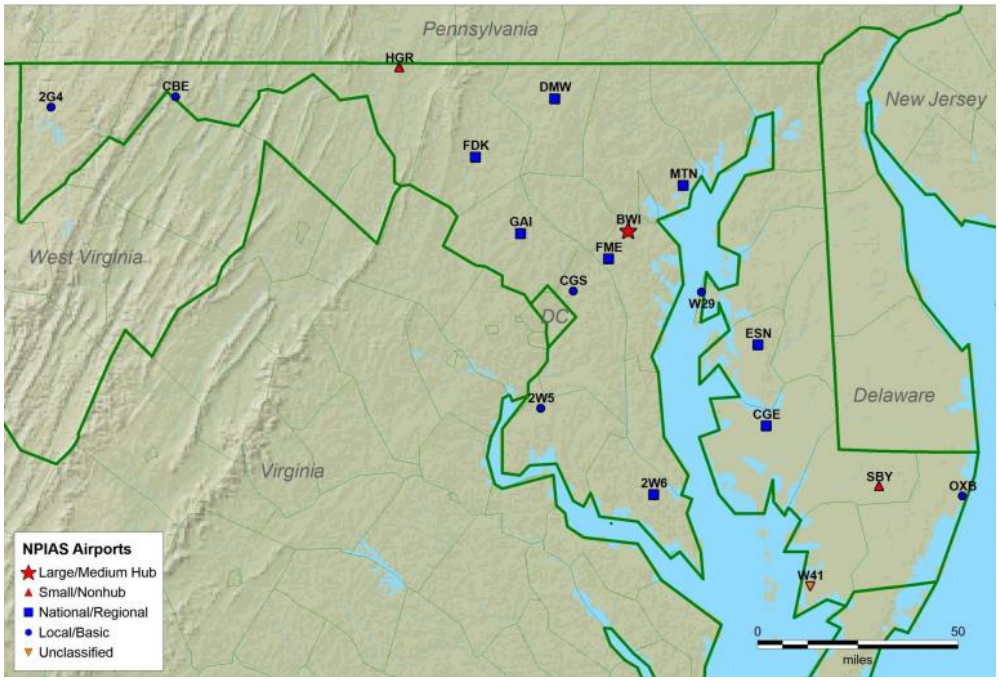
IV. NPIAS AIRPORT INVENTORY

On a national scale, the National Plan of Integrated Airport Systems (NPIAS) identifies nearly 3,400 existing and proposed airports that are significant to national air transportation and thus eligible to receive Federal grants under the Airport Improvement Program (AIP). It also includes estimates of the amount of AIP money needed to fund infrastructure development projects that will bring these airports up to current design standards and add capacity to congested airports. The NPIAS contains all commercial service airports, all reliever airports, and general aviation airports. This section contains inventories for the NPIAS airports in the states of Maryland and Virginia. The District of Columbia does not contain any NPIAS airports.

MARYLAND

The map in Figure 3 depicts the 18 NPIAS airports in the state of Maryland, nine of which are found in the Washington-Baltimore Air Systems Region. The airports found in the Washington-Baltimore Air Systems Region are sorted by status (commercial service, reliever, general aviation). The city that each airport serves is also indicated.

Figure 3: Maryland NPIAS Airports



Source: Federal Aviation Administration, 2016.

Commercial Service Airports

- BWI – Baltimore/Washington International Thurgood Marshall Airport: Baltimore/Glen Burnie

Reliever Airports

* indicates airports which are access restricted (i.e.: military airfields)

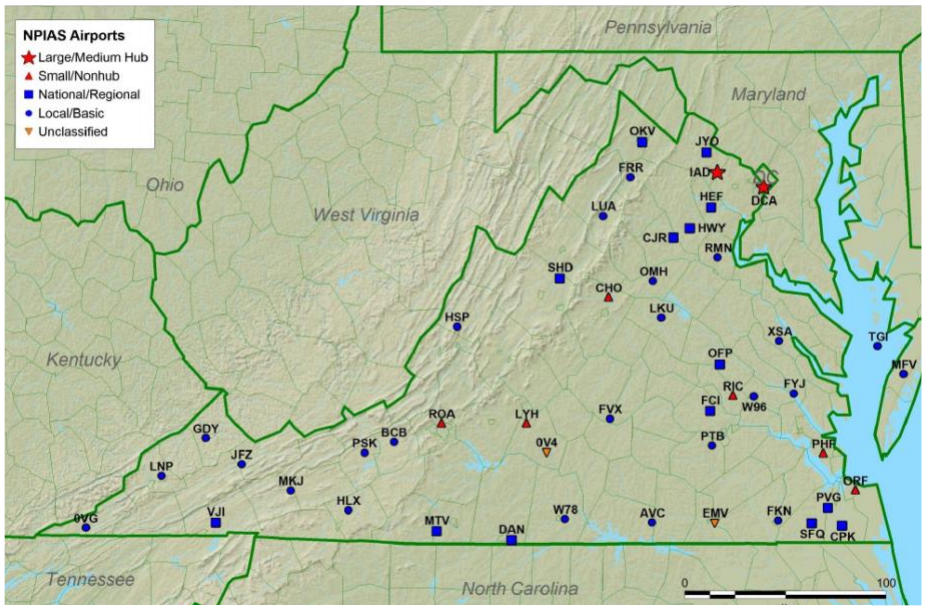
- 2W5 – Maryland Airport: Indian Head*
- DMW – Carroll County Regional Airport: Westminster
- FDK – Frederick Municipal Airport: Frederick
- FME – Tipton Airport: Odenton / Fort Meade*
- GAI – Montgomery County Airpark: Gaithersburg
- MTN – Martin State Airport: Baltimore / Middle River

General Aviation Airports

- 2W6 – St. Mary's County Regional Airport: Leonardtown
- CGS – College Park Airport: College Park
-

VIRGINIA

Figure 4: Virginia NPIAS Airports



Source: Source: Federal Aviation Administration, 2016.

Over 95 percent of Virginians currently enjoy easy access to one of the Commonwealth's airports.[25] According to the 2016 update of the Virginia Air Transportation System Plan (VATSP), the only means to substantially increase the level of accessibility would be to introduce new airports into the system. Four new general aviation airports are recommended in the VATSP to serve the areas of Lexington-Rockbridge County, Franklin County-Rocky Mount, the Northern Neck, and West Richmond.[26] The map in Figure 4 showcases the 48 NPIAS airports currently located in the Commonwealth of Virginia, six of which are found in the Washington-Baltimore Air Systems Region. They are listed below the map, sorted by status (commercial service, reliever, and national general). There are no general aviation NPIAS airports in the Washington-Baltimore Air Systems Region.

[25] Depending on the performance measure that was being analyzed, accessibility was defined as being either 30- or 45-minute drive times for Virginians to public-use airports.

[26] Virginia Air Transportation System Update 2016. Virginia Department of Aviation, 2016. http://www.doav.virginia.gov/VATSP_update_2016.htm

Commercial Service Airports

- DCA – Ronald Reagan Washington National Airport: District of Columbia / Arlington County
- IAD – Washington Dulles International Airport: District of Columbia / Dulles / Chantilly

Reliever Airports

- HWY – Warrenton-Fauquier Airport: Warrenton
- JYO – Leesburg Executive Airport: Leesburg
- RMN – Stafford Regional Airport: Stafford

National General Airport

- HEF – Manassas Regional Airport: District of Columbia / Manassas

WASHINGTON, DC

The District of Columbia does not have any NPIAS airports.

V. STATE AVIATION SYSTEM PLANS – WASHINGTON-BALTIMORE REGION

According to the Federal Aviation Administration (FAA), an aviation agency is typically authorized by state law to engage in airport system planning. It is normally under the state's aviation organization located within the Department of Transportation, an aeronautics commission, or another state planning agency. A planning agency means any agency designated by the FAA Administrator that is authorized by the laws of the state or states, or political subdivisions concerned, to engage in area wide planning for the areas in which FAA grant assistance is to be used.[27]

The state aviation agency's role in airport planning, development, and regulation often determines the scope of its system planning process. Depending on the involvement of the state agency, the airport system plan might include elements that:

- Inform the state budgetary process with assessments of resource requirements, including timing and priorities
- Provide the state with information to facilitate elected officials in making aviation planning and development decisions consistent with state goals and objectives, and with an airport's current Airport Layout Plan (ALP)
- Provide individual airport sponsors with policy, technical direction, and American Society of Testing and Materials (ASTM) standards for master planning, along with budgetary guidelines
- Provide policy guidance and act as a management and coordination resource for metropolitan and multi-state planning efforts
- Assist in coordination with other state, regional, and local planning organizations having aviation-related interests
- Provide the FAA with recommendations and supporting justification for inclusion of airports and projects in the NPIAS
- Contain special studies that provide the aviation community and the public with information on pertinent airport-related issues
- Support a continuing airport planning process, ensuring that aviation issues are continually and effectively evaluated.

[27] U.S. Department of Transportation, Federal Aviation Administration, 2015. Advisory Circular 150/5070-7: The Airport System Planning Process. Washington, DC. https://www.faa.gov/documentLibrary/media/Advisory_Circular/150-5070-7-change1.pdf

MARYLAND

Maryland Aviation System Plan (2008)

The 2008 Maryland Aviation System Plan (MASP) provides an analysis of each public use airport and an overview of Maryland's overall air transportation needs for the next 20 years. The MASP is a planning document designed to help the MAA determine the type, extent, location, timing and cost of airport development needed in Maryland to preserve and expand a safe and efficient system of airports.[28]

Nearly 95 percent of the state's population is within 60 minutes of an air carrier airport and nearly 98 percent of the population is within 30 minutes of a system airport. Even with the State's diverse geography, more than 90 percent of the State's land area is within a 30-minute drive of a system airport. Maryland's system of 35 airports is anticipated to see an increase of more than 1,000 based aircraft and 500,000 general aviation operations by 2026. Commercial operations are anticipated to grow by more than 50 percent over the planning period.

While the current system of airports was found to be well developed with outstanding infrastructure and services overall, there were areas of facility-based improvement identified. Each of the three air carrier airports met 100 percent of their system facility recommendations – which excludes the numerous local projects identified for these vital airports. Reliever airports currently meet 73 percent of their facility recommendations, while general airports meet 75 percent of their objectives, and local airports also meet 75 percent of their local objectives.

Total estimated costs for all recommended system projects amount to more than $167 million. The split of overall development between the short, mid- and long-term periods is 27 percent, 41 percent, and 32 percent, respectively, as outlined in the figure below. Note: The State funds the commercial airports through a variety of mechanisms not including in the table below, including FAA programs and airline investment, etc.

Figure 5: Recommended Projects: Costs and Phasing Summary

Airport Category	Short Term (1-5 years)	Medium Term (6-10 years)	Long Term (11-20 years)
Commercial Airports	$ 0	$ 0	$ 0
Reliever Airports	31,354,000	39,491,000	1,250,000
General Airports	11,091,000	25,950,000	53,004,000
Local Airports	3,082,000	2,545,000	0
GRAND TOTAL	**$ 45,527,000**	**$ 67,986,000**	**$ 54,254,000**

Source: Wilbur Smith Associates – via the Maryland Aviation System Plan, 2008.

While the airports vary in size, each provides service to a specific market area and plays a role in meeting Maryland's diverse air transportation and economic needs. An important element of the study was to identify the role for system airports and recommend the type of facilities and services that should be in place at each. In addition to the system airports, there are more than 100 privately-owned airports in Maryland that are restricted from public use.

[28] Maryland Aviation System Plan - 2008. Maryland Aviation Administration, 2008. http://www.marylandregionalaviation.aero/_media/clients/pdf/publications/Maryland_System_Plan.pdf

Maryland Economic Impact of Airports

The Maryland Aviation Administration conducted a study to estimate the economic impacts of the Maryland airport system. The study analyzed BWI and Martin State (MTN) airports as well as the entire statewide aviation system, which consists of 35 public use airports (including one heliport and one sea plane base), three of which are commercial service airports (BWI, Hagerstown, and Salisbury); the other 32 airports are general aviation facilities. The purpose of the study is to quantify the economic impacts generated by passenger and air cargo activity at BWI and to quantify the economic impacts generated by the general aviation and scheduled commercial service airports.[29]

The impacts are quantified in terms of jobs, employee earnings, business revenue, state and local taxes, and federal airport-specific taxes. In 2014, it is estimated that aviation activity in the State of Maryland created approximately:

- 107,105 direct, induced, and indirect jobs
- $4.3 billion of personal wages and salaries
- $7.8 billion of business revenue
- $0.6 billion of state and local taxes
- $1.8 billion of local purchases for supplies and services

The impacts are estimated for passenger and air cargo activity for calendar year 2014. In addition to the baseline impacts, an economic impact model has been developed for BWI as well as for the state's 35 general aviation/scheduled commercial service airports, which can be used to estimate the impacts associated with capital construction and expansion projects.

Activity at BWI created the majority of the state's passenger and air cargo-based economic impacts. In calendar year 2014, 22.3 million passengers used BWI, and 231.9 million pounds of air cargo moved via the Airport. This activity resulted in approximately:

- 23,419 direct, induced and indirect jobs were generated for residents of the Baltimore area.
- $1.6 billion of direct, indirect and induced personal income and consumption expenditures were generated in the Baltimore area due to the airport activity in 2014.
- $3.2 billion of business sales were generated by airport activity.
- The Federal Government received $260 million in airport-specific taxes from activity at BWI.
- State and local governments received $165.3 million in tax revenues from airport activity.

The model can be used for future annual updates of the impacts as well as to test the sensitivity of impacts to changes in:

- Passenger levels
- Domestic versus international passengers
- Passenger trip purpose
- Peak hour flight levels and mix of aircraft
- Labor productivity and work rules
- Freight level
- General aviation operations

[29] Maryland Economic Impact of Airports – 2015. Maryland Aviation Administration, 2015. http://www.marylandregionalaviation.aero/_media/clients/publications/2015/Maryland%20Statewide%20Economic%20Impact%20Report%20-%20July%202015%20Final.pdf

VIRGINIA

Virginia Air Transportation Systems Plan Updated (2016)

According to the 2016 Virginia Air Transportation System Plan Update (VATSP), over 95 percent of Virginians currently enjoy access to one of the Commonwealth's airports, and almost 210 million passengers will be added to the system over the next 25 years. The rate of growth for commercial service operations in Virginia, excluding DCA and IAD, is expected to continue to outpace the national average. To accommodate this growth, the VATSP blends the maintenance of existing airports with the strategic development and enhancement of the facilities at current airports, along with the development of new system airports.[30]

In total, the VATSP Update shows that between now and the end of the planning period, more than four billion dollars will need to be invested in Virginia's airport system to improve existing airports and to build new airports. The VATSP recommendations include projects programmed in specific years that cannot be funded when needed because of the funding gap. Meeting these unfunded system needs will require collaboration between federal, state and local leadership.

The recommended plan is based on the sensitivity analysis which considered a number of "what if" scenarios that could be encountered as they relate to optimizing system performance, as well as a Facility, Service, and Equipment (FS&E) analysis, cost scenarios, and alternative analyses. The FS&E Objectives established for each airport in the Virginia state system provide a range of directives - such as runway lengths and hangar-based needs. The VATSP identifies airport improvements needs to meet each FS&E objective, which will then be incorporated into each airport's development plan.

Within the VATSP analysis, the current system's performance is evaluated relative to the following performance measures, which indicate the percentage of the state has accessibility to each measure, via Virginia airports.

Accessibility to:

- Any Airport: 94.7%
- Commercial Service Airport: 77.3%
- 5,500-foot Runway: 73.7%
- Precision Approach: 87.2%
- Weather Reporting 92.6%
- Business Class Airports: 73.7%

An alternatives analysis gave financially unconstrained consideration to if and how current system performance could be optimized, exploring changes and improvements for the system, including:

- Extending runways at select airports
- Adding additional new general aviation airports to the system
- Improving all airports to meet their FS&E Objectives

[30] Virginia Air Transportation System Update 2016. Virginia Department of Aviation, 2016. http://www.doav.virginia.gov/VATSP_update_2016.htm

Figure 6: Recommended Virginia Air Transportation System

Source: Virginia Air Transportation System Plan Update (2016). Virginia Department of Aviation, 2016.

The Commonwealth of Virginia is currently host to a robust system of 66 public-use airports, comprised of: commercial service (9), commercial service reliever (8), reliever general aviation – regional (19), general aviation region and community (16), and general aviation – community local service (14). As indicated by the white dashed circles above, four new general aviation airports are recommended in the VATSP to serve the areas of Lexington-Rockbridge County, Franklin County-Rocky Mount, the Northern Neck, and West Richmond.

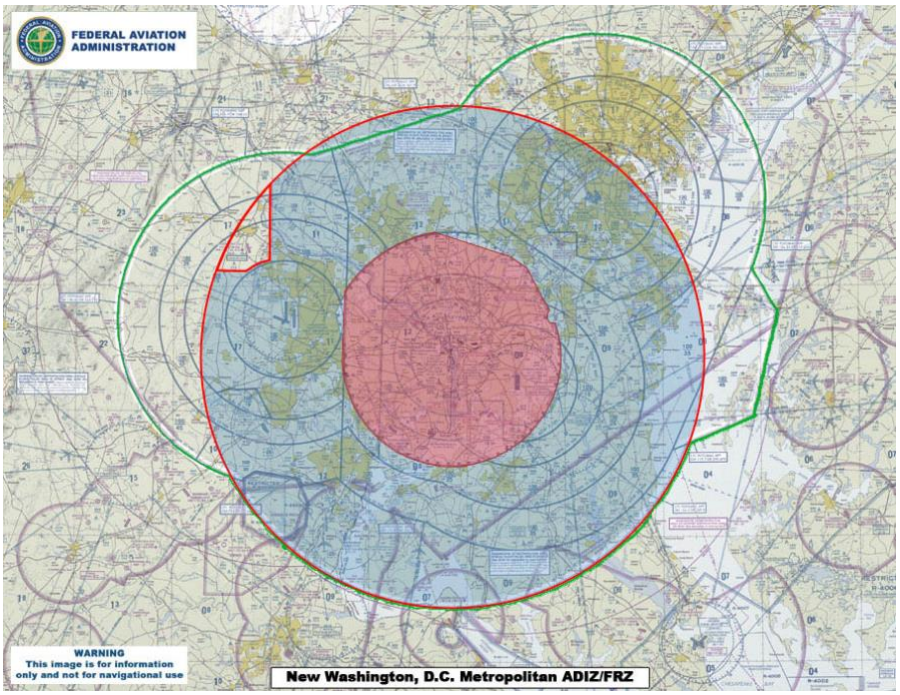
WASHINGTON, DC

Washington, DC Metropolitan Area Special Flight Rules Area

The District of Columbia does not have an airport system plan because it does not have any airports within its boundaries. Since every state is allocated Airport Improvement Plan (AIP) funds from the FAA, it is DC's AIP apportionment that funds the COG-TPB CASP Program. While DC has neither airports nor a system plan, it is significantly impacted by the plans and activities of Maryland and Virginia as well as the RASP and is most significantly impacted by the restrictions of the Air Defense Identification Zone (ADIZ) outlined below.

In 2003, an ADIZ was established, and in 2008 was made permanent to restrict air traffic near DC.[31] An ADIZ is airspace over land or water in which the identification, location, and control of civil aircraft is performed in the interest of national security. The ADIZ – now more commonly known by its components, the DC Flight Restricted Zone (FRZ) and DC Special Flight Rules Area (SFRA) – was created by the FAA in response to demands by a working group that became formalized as the National Capital Region Coordination Center. The ADIZ covers a 30-nautical-mile radius circle centered on DCA, with a small cutout for Leesburg Executive Airport.

Figure 7: Washington Air Defense Identification Zone



Source: U.S. Federal Aviation Administration, 2007.
Note: red line = 2008, green line = 2003

The ADIZ contains an even more sensitive zone within it, the Flight Restricted Zone (FRZ), which extends approximately 15 nautical miles around DCA. Air travel within the FRZ is limited to governmental flights, as well as limited set of waivered and scheduled commercial flights. Three general aviation airports are located within the FRZ: College Park Airport (CGS), Washington Executive/Hyde Field (W32) and Potomac Airport (VKX).[32]

31 Chung, Charles K. (2005). "FAA Proposes Making D.C. ADIZ Permanent" (Regulatory Review). Rotor. p. 22.
32 "ALC-55: Washington DC Special Flight Rules Area (SFRA) – Online Course." FAASafety.gov. 2011-11-29. Retrieved 2018-09-10.

VI. ADJACENT STATE AVIATION SYSTEM PLANS

While Delaware and Pennsylvania are not technically part of the Washington-Baltimore Air Systems Region, and only one county – Jefferson County – in West Virginia is, the aviation system plans are outlined below given their geographic proximity to the Washington-Baltimore Air Systems Region.

DELAWARE

Delaware Aviation System Plan Update

The 2013 Delaware Aviation System Plan Update (Phases I and II) takes a fresh look at the classifications of Delaware's airports and heliports and provides guidelines for their orderly development. The study serves as a forum for public input to the state aviation policy decision process. Review and comment from the Aviation Advisory Committee, combined with the input from State and local agencies as well as the public are important factors in deciding the course of aviation priorities and issues. The Delaware Aviation System Plan generated valuable management information tools, general aviation airport security plans, and legislative recommendations.[33]

Four Work Elements:

- Issues, Goals, and Objectives
- Analysis of Existing System
- Forecast of Aviation Demand
- Demand/Capacity & Aviation System Needs

Key Questions:

- How has the most recent recession impacted aviation in Delaware?
- Can the long-term system be sustained with fewer FAA dollars?
- What are the implications of full (unrestricted) joint use at Dover Air Force Base?
- What are the implications of scheduled airline passenger service in central Delaware?
- Is civilian air cargo service possible in Delaware?
- What impact would the implementation of green technology have on system airports?
- What aviation subsystems require State regulation, guidance, policy input, or financing?
- What are the financial implications of the recommended plan?
- How is the recommended plan implemented?

Key issues that could change the aviation system in Delaware include the possible unrestricted joint use of Dover AFB, the development of a civilian air cargo hub at the Civil Air Terminal at Dover AFB, the loss of one or more private airports, and the removal of Summit Airport from the FAA funding program. Allegiant Airlines has selected Salisbury, Maryland to initiate service to the Orlando, Florida area, but Dover remains another possible outlet for Allegiant service. While it is not explicitly called out in the system plan, it is worth noting that there are currently efforts to establish commercial service at New Castle County Airport (ILG), which has implications for BWI's catchment area.

[33] "Delaware Aviation System Plan Update – 2013." Delaware Department of Transportation, 2013. https://www.deldot.gov/Programs/aviation_svcs/pdfs/sys_plan/DASPU_Phase_2_Report.pdf

PENNSYLVANIA

Statewide Airport System Plan

The 2007 Pennsylvania State Airport System Plan (SASP) Update addressed the following:[34]

Updated Classification Criteria and Reclassified Airports

The 2007 SASP Update defined airport classifications based solely on the objective facility amenities and services for each airport type. All "advanced" and several "intermediate" airports were reviewed and reclassified as "commercial service," "advanced," and "intermediate."

State of the System

SASP airports' adherence to the performance criteria for the "commercial service," "advanced," and "intermediate" classifications were reviewed, comparing the performance criteria data contained in the 1999 and 2005 SASP airport inventory tables. Most of Pennsylvania's airports meet the key performance criteria for runways and taxiways.

Pennsylvania's NPIAS Airports

The FAA entry requirements for NPIAS airports were studied as were the 64 AIP eligible NPIAS airports in Pennsylvania. Eight case-study airports were examined, and recommendations made regarding their NPIAS status. This process was documented for future use by PennDOT. A GIS map was developed to illustrate the coverage of NPIAS airports throughout the state, based on 30-minute drive times.

Project Benefits and System Contribution Analysis

In order to analyze and prioritize projects, a process was developed to determine which projects provide the greatest benefit to the system based on the operational contribution to the system and on project cost. The process calculates the operational contribution to the system from runway, taxiway, and apron projects. The process assigns a higher weight to projects at busier airports and identifies the level of sponsor and project readiness.

Definition of an Ideal Four-Year Funding Level

A tool was developed to estimate ideal or realistic funding levels tied to typical project implementation timelines and statewide funding demand for any four-year period. This tool provides an estimate of ideal funding levels that are supportable and realistic.

Market Areas of CASP Airports

It is worth noting that for large swaths of South-Central Pennsylvania, BWI or IAD are much closer and/or offer more service than Pittsburgh (PIT), Harrisburg (MDT), and Philadelphia (PHL). Consideration of the market areas of the CASP airports will be elaborated on in subsequent phases of the RASP.

[34] "Statewide Airport System Plan – 2007." Pennsylvania Department of Transportation, 2007. https://www.penndot.gov/Doing-Business/Aviation/Planning%20and%20Zoning/Pages/2007-Statewide-Airport-System-Plan.aspx

WEST VIRGINIA

West Virginia Multimodal Statewide Transportation Plan

This 2010 study examines the 34 airports in West Virginia that are open for public use, whether they are owned by public or private entities. There are many privately owned airports in the state that are not open to public and not included in this analysis.[35]

West Virginia is rich in history and natural beauty. The state offers a wide range of tourist and outdoor recreational opportunities, such as hunting, fishing, caving, rock climbing, whitewater rafting, and hiking. The strong tourism and recreation market along with its universities and businesses support commercial passenger and general aviation activity at the state's airports. Currently, the Aeronautics Commission of WVDOT oversees 34 public use airports. While these existing airports serve the current air travel demand generated in the state, this section documents existing conditions and identifies the potential needs for these airports over the next 25 years.

The total projected cost for runway, taxiway, and weather equipment for West Virginia's airports over the next 10 years is summarized in the table below. No additional projects have been identified beyond 2018 as part of this study.

Figure 8: Total Projected Airport Cost

Type of Project	State	Total
Runway Rehabilitation	$240,132	$9,605,263
Runway Extensions	$234,974	$9,398,947
Taxiway Improvements	$291,961	$11,678,421
ASOS	$5,000	$200,000
Total	$772,066	$30,882,632

Source: West Virginia Multimodal Statewide Transportation Plan, 2010.

As the state transforms from a coal mining economy into a tourism, service, aerospace industry, and technology-based economy, access to aviation facilities and services is one important factor that will help foster this growth. The recommended needs that satisfy future aviation demand are essential to support the growing needs of the aviation industry in the state. The closures of two airports, Roy Airfield and Welch Municipal Airports may have a local effect on general aviation access. However, the recent expansion of Boggs Airfield in Spencer is expected to improve the aviation access in that area of the state. The state's support of aviation and the economic benefits generated from these facilities will have positive impacts for the community many times greater than the state will expend.

Market Areas of CASP Airports

It is worth noting that for large swaths of West Virginia, IAD is much closer and/or offers more service than Yeager (CRW) or PIT. Consideration of the market areas of the CASP airports will be elaborated on in subsequent phases of the RASP. The recent improvements to Appalachian Development Highway System Corridor H (US 48) has improved IAD's market standing in the Potomac Highlands. Improving Corridor H in Virginia is low priority but also benefits IAD access.

35 "West Virginia Multimodal Statewide Transportation Plan - 2010." West Virginia Department of Transportation, 2010. http://transportation.wv.gov/highways/programplanning/planning/statewide/Documents/West_Virginia_Long_Range_Multi-modal_Transportation_Plan.pdf

VII. ACRP REPORTS ON THE STATE OF PRACTICE

INTRODUCTION

The need for the Airport Cooperative Research Program (ACRP) was identified in *TRB Special Report 272: Airport Research Needs: Cooperative Solutions* in 2003, based on a study sponsored by the Federal Aviation Administration (FAA). The ACRP carries out applied research on problems that are shared by airport operating agencies that are not being adequately addressed by existing federal research programs. The ACRP is modeled after the successful National Cooperative Highway Research Program and Transit Cooperative Research Program. The ACRP undertakes research and other technical activities in a variety of airport subject areas, including design, construction, maintenance, operations, safety, security, policy, planning, human resources, and administration. Furthermore, the ACRP provides a forum where airport operators can cooperatively address common operational problems.

A careful review of existing ACRP reports was conducted to best gauge the state of the practice in regional air system planning. The following ACRP reports primarily concern ground access to airports, which is the focus of this RASP.

AIRPORT SYSTEM PLANNING PRACTICES (2009)

TRB's ACRP Synthesis 14: Airport System Planning Practices explores the extent to which state aviation agencies and regional planning organizations are involved in airport system planning. The report also examines the type of studies these organizations perform and how successful their efforts have been in meeting the planning process objectives.[36]

The focus of this report is on how airport system plans are now being conducted and used. The synthesis collected information on each of the following:

- General background information, including: the plan's funding source, number of airports analyzed, and ownership of system airports
- Interface of the planning effort with the National Plan of Integrated Airport Systems (NPIAS)
- Coordination and other outreach efforts that characterize the planning process
- Various elements or special studies included in the planning effort
- Ways that plans are being used and implemented

All 50 state aviation directors, as well as the directors from Guam and Puerto Rico, were surveyed to collect information on their current airport system planning practices. This report also presents several case studies that focus on multi-state and metropolitan or regional aviation system plans. This synthesis reports on current airport system planning practices based on survey results, case studies, and a literature review.

[36] National Academies of Sciences, Engineering, and Medicine. 2009. *Airport System Planning Practices*. Washington, DC: The National Academies Press. https://doi.org/10.17226/23041.

Changes in federal funding for airport planning have eliminated the specific allowance for system planning, although the FAA can still allocate funds to system planning activities, resulting in system planning activities competing against other planning needs, such as airport master plans or even capital improvement projects. The literature review poses the question of whether sufficient funds are being dedicated to planning activities, considering the complexity of the issues and the recognition that it is important that aviation be examined within the broader, multimodal, multi-jurisdictional context.

According to the report, the airport system planning process checks the "reasonableness" of individual airport master plans - including determining whether individual system airports are over or under planning based on demand and constraints at other nearby airports.

Key takeaways from ACRP Synthesis 14 that are most relevant to the RASP Update include:

- 59 percent of respondents involved MPOs in the preparation of their most current state airport system plan – 41 percent did not. 24 percent of participants reported that they have at least one MPO in their state that conducts its own airport system planning efforts.

- Based on survey results, there may be an opportunity by states or MPOs to prolong the useful life of system plans as only 32 percent of states noted that they are undertaking any continuous system planning once their plan is completed.

- 90 percent of survey respondents indicated that their plans include a comprehensive forecasting element; 88 percent of the plans have assigned airports to system roles; 67 percent of the plans considered ground access or intermodal connectivity.

- Only 60 percent of survey participants reported that they use their system plan to make actual funding decisions for development at system airports, while 62 percent indicated that their system plan helps them improve their accountability by showing how their investment improves system performance.

- Based on their objectives for their individual plans, 28 percent of respondents rank their plans as being very effective; 43 percent rank their plans as being effective; while the remaining 30 percent rank their plans as being somewhat effective or not effective.

- 52 percent of respondents indicated that their airport system plans considered, in some way, either aviation demand attraction from neighboring states or demand lost to neighboring states. Only 5 percent of all survey respondents involved their counterparts in neighboring states during the development of their most recent airport system plan.

AIRPORT CURBSIDE AND TERMINAL AREA ROADWAY OPERATIONS (2010)

TRB's ACRP Report 40: Airport Curbside and Terminal Area Roadway Operations, includes guidance on a cohesive approach to analyzing traffic operations on airport curbside and terminal area roadways. The report examines operational performance measures for airport curbside and terminal area roadway operations and reviews methods of estimating those performance measures. The report includes a quick analysis tool for curbside operations and low-speed roadway weaving area,

highlights techniques for estimating traffic volumes, and presents common ways of addressing operational problems.[37]

According to Report 40, the main differences between the operating characteristics of airport terminal area access and circulation roadways and non-airport roadways include:

- High proportion of unfamiliar motorists
- Large number of complex directional signs
- Stressful conditions due to upcoming air travel
- High proportion of large vehicles
- Mix of experienced and inexperienced drivers
- Recirculating traffic, which contributes significantly to roadway congestion

To estimate future airport roadway traffic volumes, the traditional four-step approach should be implemented, which involves estimating the trips generated, determining trip distribution, analyzing travel mode choice, and assigning traffic volumes to the on-airport and regional roadway networks. It is worth noting that mode choice analysis here is defined by mode choice patterns of both passengers and employees, whereas the Baltimore-Washington Regional Air Passenger Survey only considers mode choice and general patterns and preferences of departing air passengers.

The report highlights several challenges to estimating roadway traffic volumes, including the lack of data on airline passengers and hourly passenger volumes, the effort needed to gather required data, and the resulting accuracy of the forecast. When acquiring this data is not possible, the growth factor method for estimating future traffic volumes – the ratio between traffic volumes in the current peak hour and in the peak hour to be analyzed – is recommended.

Performance measures for evaluating airport curbside operations include number of vehicles parked in the second and third lanes; queue length; queue duration; and average vehicle delay. The report recommends the following for more accurately estimating airport curbside roadway traffic volumes:

- Separate estimates of vehicles stopping in a curbside lane and through traffic vehicles
- Separate analyses of the curbside departures and arrivals roadways
- Separate analyses for each class of vehicle
- Separate estimates of traffic volumes for each terminal building or concourse

ACRP Report 40 concludes by identifying the most typical terminal area roadway problems and a detailed set of strategies for resolving each issue (see report), which are generally categorized into physical improvements, operational measures, and airport policies. Issues highlighted include:

- Insufficient roadway and merging capacity
- Inadequate weaving distance
- Lane imbalance
- Directional information overload
- Insufficient decision-making distance
- Insufficient queuing space
- Unexpected lane drops and inadequate taper lengths
- Unexpected transition from high-speed to low-speed roadway environment

[37] National Academies of Sciences, Engineering, and Medicine. 2010. Airport Curbside and Terminal Area Roadway Operations. Washington, DC: The National Academies Press. https://doi.org/10.17226/14451.

HANDBOOK TO ASSESS THE IMPACTS OF CONSTRAINED PARKING AT AIRPORTS (2010)

TRB's ACRP Report 34: Handbook to Assess the Impacts of Constrained Parking at Airports explores different types of parking constraints that airports experience and highlights tools to assess the impacts of the constraints and strategies to deal with them.[38] The report considers two types of customers when addressing parking strategy: the flying public and employees.

The following objectives for managing constrained airport parking environments were highlighted:

- Financial
- Customer Service
- Traffic Management and Mode-Share
- Environmental
- Land-Use

The report provides strategies for addressing constrained customer parking, separated by ongoing and short-term constraints – as well as strategies to address constrained employee parking:

- Ongoing Constraints
    - Increase parking supply
    - Introduce new parking products
    - Reallocate supply among parking categories
    - Adjust parking rates
    - Introduce technology improvements
    - Promote use of HOV modes

- Short-Term Constraints
    - Provide hands-on management in constrained parking facilities
    - Adjust parking rates on a temporary basis
    - Disseminate public information
    - Provide temporary overflow parking
    - Direct parking customers to private operated parking facilities

- Constrained Employee Parking
    - Increase capacity
    - Consolidate the parking supply
    - Reassign parking facilities
    - Adjust parking rates
    - Offer alternatives to the drive-alone commute

The report concludes with recommendations for data sources and performance measurements to utilize when evaluating the effectiveness of strategies:

- Data Sources
    - Parking revenue control system
    - Supplemental parking data
    - Airline origin and destination (O&D) passenger survey data

[38] National Academies of Sciences, Engineering, and Medicine. 2010. Handbook to Assess the Impacts of Constrained Parking at Airports. Washington, DC: The National Academies Press. https://doi.org/10.17226/14435.

    - Vehicle activity and vehicle occupancy counts
    - Enplaned O&D passenger activity

- Performance Measurements
    - Public parking activity
    - Financial performance
    - Vehicle traffic volume
    - Emissions generated
    - Mode-share distribution
    - Customer service

EXPLORING AIRPORT EMPLOYEE COMMUTE AND PARKING STRATEGIES (2012)

TRB's ACRP Synthesis 36: Exploring Airport Employee Commute and Parking Strategies analyzes what is known about airport employee commute patterns and commute modes. The report addresses alternatives to the drive alone commute for airport employees, the effectiveness and challenges of airport employee commute options programs, and commute options programs offered by non-airport employers that might be applicable to the airport environment.[39]

The report highlights the following strategies and challenges in the provision of airport employee commute options programs:

Strategies

- Incentives
    - Subsidies
    - Provision of vanpools
    - Pre-tax earnings
    - Transportation discounts
    - Parking cash-out
    - Work schedule adjustments like telework, compressed work week, flex time
    - Rewards like cash, paid leave, goods and services, prize drawings

- Supporting strategies
    - Ride-matching services
    - Guaranteed ride home / emergency ride home
    - Preferential parking for carpools and vanpools
    - Transportation for mid-day trips
    - On-site amenities like a childcare facility, gym, dry cleaner
    - Commuting by bicycle

- Disincentives
    - Parking pricing
    - Parking location

[39] National Academies of Sciences, Engineering, and Medicine. 2012. Exploring Airport Employee Commute and Parking Strategies. Washington, DC: The National Academies Press. https://doi.org/10.17226/22724.

- Marketing
    - Printed materials
    - Employee newsletters
    - Orientation materials for new employees
    - Campaigns to encourage ridesharing and other non-SOV commutes
    - Holding events to promote ridesharing, public transportation, walking, biking
    - Website that provides information on alternatives to driving alone to work

- Program management
    - Dedicated staff provided by employer
    - Collective involvement among airport employers
    - Centrally located office where employees may obtain information

- Provision or enhancement of scheduled transportation services
    - Communication
    - Subsidies
    - Initiating new service

Challenges

- Public transportation system
- Employee parking supply
- Employee participation
- Airport employer participation
- Funding
- Availability of data
    - Total airport employees
    - Employee demographics and commute characteristics
    - Employee commute preferences
    - Vehicle trips
    - Parking spaces provided by airport employers
    - Employee commute options programs offered by airport employers

The report concludes with the following key findings:

- Very few U.S. airport operators provide employee commute options (ECO) programs

- The benefits of ECO programs extend beyond satisfying requirements, resulting in shifts to higher-occupancy modes, a reduction in vehicle trips generated by employees and the associated environmental benefits, and enabling employees to choose not to drive alone to work, providing them with more viable options for commuting.

- The airport operator is directly responsible for a small proportion of total airport employees – thus the ECO programs are responsible for a smaller reduction in the average vehicle trips generated by the total airport employee population. No airport operator interviewed was aware of all employers based at its airport that offered ECO benefits.

- Airport surveys are conducted at four airports on a regular basis to understand employee commute patterns: Boston Logan International Airport (BOS), London Stansted Airport (STN), Los Angeles International Airport (LAX), and Portland International Airport (PDX).

- The airport operators interviewed were missing the following data that would assist them in furthering their employee commuter options programs: the total number of airport employees (i.e.: many employees do not have security badges, so the security badge file does not provide the total employee count); the proportion of employees that work within walking distance of the airport terminal area; the number or percentage of vehicle trips generated by the employee population; and the number of employee parking spaces provided by tenants through leases.

COMMERCIAL GROUND TRANSPORTATION AT AIRPORTS: BEST PRACTICES (2015)

TRB's ACRP Report 146: Commercial Ground Transportation at Airports: Best Practices covers best management practices to ensure the provision of safe, comfortable, easy-to-use, and efficient commercial ground transportation service. Commercial ground transportation services include taxicabs, limousines, shared-ride services, transportation network companies, courtesy vehicles, buses, and vans; the guidebook does not address rail transit and public transit access to airports or airport automated people mover systems. The guidebook reviews the ground transportation industry, potential solutions to challenges airport operators frequently face, how to select a solution, and how to implement the selected best practice.[40]

The report provides the following framework for commercial ground transportation goals:
- Enhance the experience of the airport customer
- Minimize required staff time and airport resources
- Support airport and regional environmental and sustainability objectives
- Establish an environment that allows drivers to earn a fair wages and other business owners to receive a reasonable return on their investment
- Recover costs, and to the extent possible, increase revenues consistent with the above goals

The following metrics can be used to evaluate an airport's ground transportation performance:
- Passenger volumes
- Proximity – comparing nearby airports
- Distance to downtown
- Physical configuration or layout
- Business relationship with commercial vehicle operators
- Customer demographics
- Legal and political environment / governance structure
- Financial and staff resources

The report compares the utility and cost of a range of supporting technologies for ground transportation management (GTM), and concludes with recommendations on how airports can best sell and implement proposed solutions to senior airport management and working with key stakeholders, including: the providers and drivers, elected officials and airport boards, local and state regulatory agencies, and the traveling public. Having the problem or need for improvement

[40] National Academies of Sciences, Engineering, and Medicine. 2015. Commercial Ground Transportation at Airports: Best Practices. Washington, DC: The National Academies Press. https://doi.org/10.17226/21905.

documented, the data analyzed, and the recommendations developed are key in implementing any proposed solution. Implementing the solution will entail obtaining budget approval, revising rules and regulations including modifying commercial ground transportation permits or fees, and finally - improving commercial ground transportation facilities – which may likely involve deploying new technologies.

INNOVATIVE REVENUE STRATEGIES – AN AIRPORT GUIDE (2015)

TRB's ACRP Report 121: Innovative Revenue Strategies – An Airport Guide describes a broad range of tools and techniques to improve airport revenue streams, recover costs, and achieve operational efficiencies. The report identifies customer needs; airport-provided services and shared services, facilities, and equipment; revenue participation in real estate and natural resource development; value capture and other financing opportunities; and improvements to existing airport businesses.[41]

To enhance financial strength and resilience, airport operators must develop a clear strategic vision concentrating around the following key areas:

- Increased airport revenues and funding sources
    - Development of real estate, natural resources, and other non-aviation businesses
    - Redesign and enhancement of existing services
    - Value capture and other innovative financing

- Improved performance in all functional areas of the airport
    - From baggage handling and check-in to security, concessions, and overall comfort

- Optimized use of airport assets
    - Shared use facilities, systems, and equipment

- Competitive differentiation from other airports
    - Highlighting key assets, from airline service to transportation infrastructure to concessions, entertainment, and other service or atmosphere-based amenities

- An airport organization that is responsive at all levels
    - A systematic protocol, airport culture, and communications strategy to minimize issues and maximize customer satisfaction

Airports can design new – or refresh existing – concession programs, recruit concessionaires, and manage the program, as one of many means for generating new revenue. The Indianapolis Airport Authority redesigned a new concession program as part of its new Midfield Passenger Terminal building complex. The program emphasized a focus on customer experience, an innovative approach to solicitation of concessions, inclusion of many local businesses at the airport, and a lean management approach to oversee the program.

Value capture and other innovative financing techniques can be implemented to help airports capture value from off-airport businesses that depend on airport activity, including off-airport parking, rental cars, hotels, and land-lease agreements. Dallas/Fort Worth International Airport's foreign trade zone (FTZ) illustrates how an airport sponsor can leverage its cargo and passenger

[41] National Academies of Sciences, Engineering, and Medicine. 2015. Innovative Revenue Strategies – An Airport Guide. Washington, DC: The National Academies Press. https://doi.org/10.17226/22132.

operations and its standing as a regional economic center to stimulate economic value beyond the airport gate.

The report concludes by reminding readers that today there is no such thing as a simple commercial airport: most airports oversee a complex set of enterprises. While the financial contribution of airlines to airports remains significant, airport operators are seeking additional ways to pay for maintenance, day-to-day operations, and capital projects. For most airports, increasing net revenue to the airport sponsor comes from cost savings, improvements to existing airport businesses, and engagement in new, non-aviation-related activities. To do so, airports must have a vision, develop a strategy, and be nimble in their approach to recognizing opportunities, evaluating risk, and engaging in innovation.

ESTIMATING TRUCK TRIP GENERATION FOR AIRPORT CARGO ACTIVITY (2017)

TRB's ACRP Synthesis 80: Estimating Truck Trip Generation for Airport Air Cargo Activity compiles existing information about air cargo truck trip generation studies. The existing literature and research regarding air cargo facility-related truck trip generation rates is limited in its scope and detail. In addition, the complexity of the modern air cargo industry makes it difficult to obtain the data necessary to develop truck trip generation rates. Access to such information could conceivably help a community plan and invest appropriately by accounting for air cargo's impacts. Similarly, air cargo operators and airport officials could employ such data to help ensure cargo facility truck access and egress remains reliable and safe.[42]

Determinants and complexities of air cargo truck trips include:

- Dynamic cargo types and volumes
- Facility types
- Reduce air cargo capacity and shifts to truck use
- Pace and nature of change in the air cargo industry
- Data sources and access

To date, the interviews conducted indicate that there has been limited interest in understanding the truck trips generated by air cargo facilities, especially on off-airport roadways, to date.
The principal gap remains the lack of availability of current and usable data on air cargo facility-related truck trips. An approach employed by LAX in 2010 employed the "trucks per ton" method using data available through the LAX traffic generation reports and compared the results with actual trip numbers. While this approach may be replicable elsewhere, additional research that compares with any truck trip modeling results would help to evaluate this method for other large airports and determine the most effective approach to utilize.

The report concludes by positing that as the value, volume, and importance of air cargo grows, airports and transportation planners may place more emphasis on truck traffic associated with that growth. Until the information gap is filled to better understand the details of truck trips serving air cargo facilities such as volumes, tonnage, times of day, and types of trucks, it will remain difficult to develop guidance that practitioners and airports can apply with confidence.

[42] National Academies of Sciences, Engineering, and Medicine. 2017. Estimating Truck Trip Generation for Airport Air Cargo Activity. Washington, DC: The National Academies Press. https://doi.org/10.17226/24848.

TRANSPORTATION NETWORK COMPANIES: CHALLENGES & OPPORTUNITIES FOR AIRPORT OPERATORS (2017)

TRB's ACRP Synthesis 84: Transportation Network Companies: Challenges and Opportunities for Airport Operators compiles experiences and effective practices by airports in facilitating customer access to Transportation Network Companies (TNCs) like Uber and Lyft. This synthesis also summarizes the amount of revenue airports receive from TNCs and how TNCs are affecting airport operations and other businesses.[43]

This report was prepared to address the opportunities and challenges that TNCs introduce to airports and summarizes how airport operators:

- Permit and regulate TNCs
- Locate TNC passenger drop-off and pickup areas and TNC vehicle staging / holding areas
- Establish and enforce regulations concerning TNC drives and vehicles, including penalties
- Establish the fees charged to TNCs and collect and confirm payment of such fees
- Monitor TNC vehicle trips, including the use of geo-fence boundaries and other tools to enforce TNC operations

Key findings include:

Permits and Regulations

- Airports rely on the regulations developed by state or other local jurisdictions that establish minimum standards for companies, vehicles, and drivers. Most airports require that in order to drop off and pick up airport passengers, TNCs sign an airport permit indicating the company agrees to abide by airport regulations that supplement those established by the state or local jurisdiction.

Drop-off and Pickup

- At most airports (63 percent), TNCs drop off customers at the same location as do private vehicles; the remaining airports require TNCs to drop off passengers at the commercial vehicle boarding area or at the passenger pickup / boarding areas. Of the airports surveyed, 82 percent provided a dedicated staging area: a surface lot (55 percent), an area with a parking structure (20 percent) or an area also used by taxicab, limousine, and other commercial ground transportation drivers (7 percent).

Airport Regulations Enforcement

- Most airports (87 percent) rely on curbside traffic officers or airport operations staff to enforce TNC rules and regulations. Police support these traffic officers or are solely responsible for enforcement at nearly half of the responding airports. About 80 percent of the airports surveyed rely on self-reported trip data provided by the TNCs to confirm payment of the correct airport fees.

Fees Charged to TNCs

- Most airports – 47 or the 48 surveyed that hold TNC permits – require that TNCs pay at least one of the following fees: annual permit fee (10 airport), per-trip fee (87 percent of airports), activation fee (eight airports), and/or minimum annual guarantee amount (three airports).

[43] National Academies of Sciences, Engineering, and Medicine. 2017. Transportation Network Companies: Challenges and Opportunities for Airport Operators. Washington, DC: The National Academies Press. https://doi.org/10.17226/24867.

Revenues Received from TNCs

- The annual revenue airports receive from TNCs depends on the type and amount of fees the TNCs are required to pay, the number of airport passengers, and the maturity of the market. At most airports, the volume of TNC trips has increased during the months that the TNCs have been permitted to operate. While volumes of TNCs and fee collection totals are expected to increase moving forward, as of the publication date of this report, seven small hub airports received annual revenues of less than $100,000; ten received $100,000 – $1 million; ten received $1 million - $5 million; and four large-hub airports received more than $5 million, with two of them receiving more than $20 million.

Impact on Airport Operations

- TNCs have had numerous impacts on airport operations, including: additional responsibilities for airport operations staff; increased curbside or roadway congestion at 46 percent of airports; a 5 to 30 percent decrease in taxicab trips and an 18 to 30 percent decrease in shared-ride van customers; a 10 to 20 percent decline in the use of private vehicles; a 5 to 10 percent decrease in parking revenue; and a 13 percent reduction in rental car transactions.

Impact on Airport Total Revenues

- A larger question, which remains unanswered from this report, is whether "new" revenues received from TNCs exceed the foregone revenues an airport would have received if TNCs were not permitted to operate. Particularly, any decline in public parking or rental car revenues could adversely affect an airport's finances. A 2016 survey indicated that median gross parking revenue was $63 million for large-hub airports, $23 million for medium-hub airports, and $9 million for small-hub airports. Thus, a 10 percent reduction in these parking revenues would equal or exceed the TNC revenues reported by all but two of the 31 airports included in this study. Those foregone revenues do not include foregone revenues that may result from a change in the use of rental cars, taxicabs, or other transportation services.

CONCLUSION

The report and synthesis documents outlined above will inform the Airports Needs Assessment and Ground Access Forecast conducted in the subsequent second and third phases of the RASP Update. Key takeaways from the documents of greatest relevance to the remainder of the RASP are highlighted below.

ACRP Synthesis 14: Airport System Planning Practices

- The outreach efforts for and utilization of the airport system planning practices highlighted in this study will continue to inform the implementation of the RASP.

ACRP Report 40: Airport Curbside and Terminal Area Roadway Operations

- The growth factor method for estimating future traffic volumes referenced in this report will help inform the Airports Needs Assessment conducted in RASP Phase 2, as curbside traffic volumes for each airport are not readily available, beyond the data collected in COG-TPB's biennial Regional Air Passenger Survey.

ACRP Report 34: Handbook to Assess the Impacts of Constrained Parking at Airports

- Parking capacity – and the revenue generated by parking facilities – are of great importance to the financial health and functional success of the region's three major commercial

airports. The strategies for addressing ongoing and short-term parking constraints, as well as the overall employee parking constraint-related challenges, will be of great value to the Airport Needs Assessment in RASP Phase 2. As airports seek to gain further understanding of their existing parking capacity and future needs, the recommended data sources and performance measurements outlined will also be of value.

ACRP Synthesis 36: Exploring Airport Employee Commute and Parking Strategies

- The four airport surveys highlighted in this study, along with the data research gaps, strategies, and challenges highlighted will all inform the Airport Needs Assessment of RASP Phase 2 and the Recommendations that RASP Phase 3 will conclude with.

ACRP Report 146: Commercial Ground Transportation at Airports: Best Practices

- The framework for commercial ground transportation goals and associated metrics to evaluate airport ground transportation performance will directly inform the framing of the performance-based metrics utilized in the RASP Phase 2 Airports Needs Assessment.

ACRP Report 121: Innovative Revenue Strategies – An Airport Guide

- Revenue generation is the cornerstone of every airport's success. In an ever-changing global economy and multimodal world, the landscape for airport revenue generation has changed significantly in recent years. This report underscores the importance of how airports can and must diversify their revenues and funding sources – key recommendations that will be integrated into RASP Phase 3.

ACRP Synthesis 80: Estimating Truck Trip Generation for Airport Air Cargo Activity

- This study emphasizes the determinants and complexities of air cargo truck trips, as well as the significant information gathering gap that remains in this field. In addition to informing the Airports Needs Assessment and Ground Access portion of RASP Phases 2 and 3, the findings of this study will be communicated to the three airports to encourage means for expanding their own data collection efforts as it relates to airport cargo activity.

ACRP Synthesis 84: Transportation Network Companies: Challenges and Opportunities for Airport Operator

- TNCs have drastically shifted the ground access to and revenue generation of airports throughout the country, including in the Metropolitan Washington region. The findings from this report will be shared in detail with each of the airports and utilized to inform how the Airports Needs Assessment ground access metrics are formulated, and how the Ground Access Forecast is framed.

VIII. NATIONAL CASE STUDIES

In the summer of 2018, interviews were conducted with five metropolitan planning organizations (MPOs) that, like COG-TPB, are host to sizeable air systems planning programs – and one not-for-profit regional planning organization, the Regional Plan Association. Case studies of their most recent regional air systems planning efforts are included in this section.

The entities featured in this section are:

- Delaware Valley Regional Planning Commission (DVRPC)
- Houston-Galveston Area Council (HGAC)
- Metropolitan Transportation Commission (MTC)
- North Central Texas Council of Governments (NCTCOG)
- Regional Plan Association (RPA)
- Southern California Association of Governments (SCAG)

DELAWARE VALLEY REGIONAL PLANNING COMMISSION (DVRPC)

2040 Regional Airport System Plan (2014)

The purpose of this report is to provide an update to the 2035 Regional Airport System Plan (RASP) on base data (such as based aircraft and traffic counts), population, employment, operational and capacity forecasts, and recommendations to 2040. In addition, the report will provide an overview and analysis of the issues and trends impacting regional airport system development. Based on that analysis, the report makes detailed airport system development and investment recommendations to guide aviation in the region for the foreseeable future.[44]

Objectives:

Expand commercial air service capacity within the region.

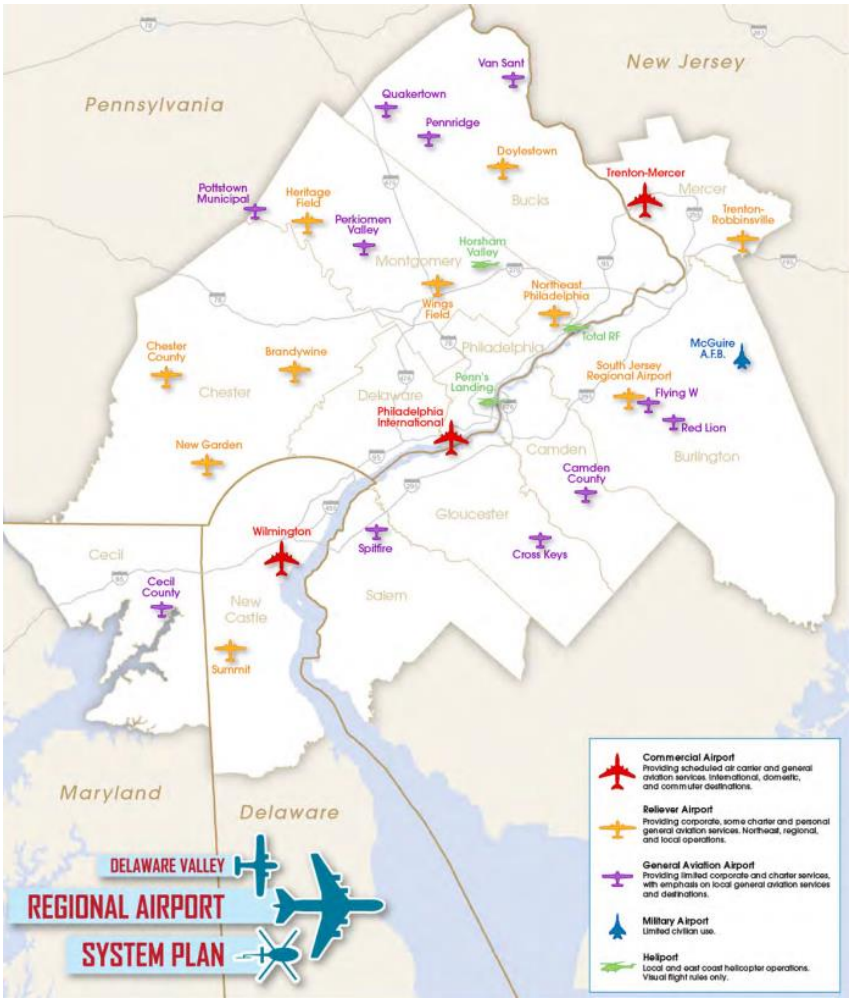
Preserve the existing public-use GA airport system.

Sustain and improve infrastructure to attract more users.

Improve community outreach to inform the public of the importance of airports to the local and regional economy.

Improve efforts to attract students to careers in aviation fields.

Figure 9: Regional Airport System Map - DVRPC



Source: Delaware Valley Regional Planning Commission, 2014

[44] "2040 Regional Airport System Plan." Delaware Valley Regional Planning Commission, 2014. https://www.dvrpc.org/reports/13064.pdf

HOUSTON-GALVESTON AREA COUNCIL (H-GAC)

Gateways to Our Communities: 2040 Regional Aviation System Plan (2011)

The Regional Aviation System Plan (RASP) is the framework for airport development in the 13-county Houston-Galveston region. The plan examines the region's airports, evaluates how well they are performing today, and determines what improvements are needed in the future. The RASP seeks to ensure that the region's airports are preserved, that they have the facilities and capacity to operate safely and efficiently, and that they provide maximum economic benefits to their local communities and the region.[45]

Objectives:

Inventory facilities and condition of regionally significant airports.

Consult with leaders of communities in which airports are located.

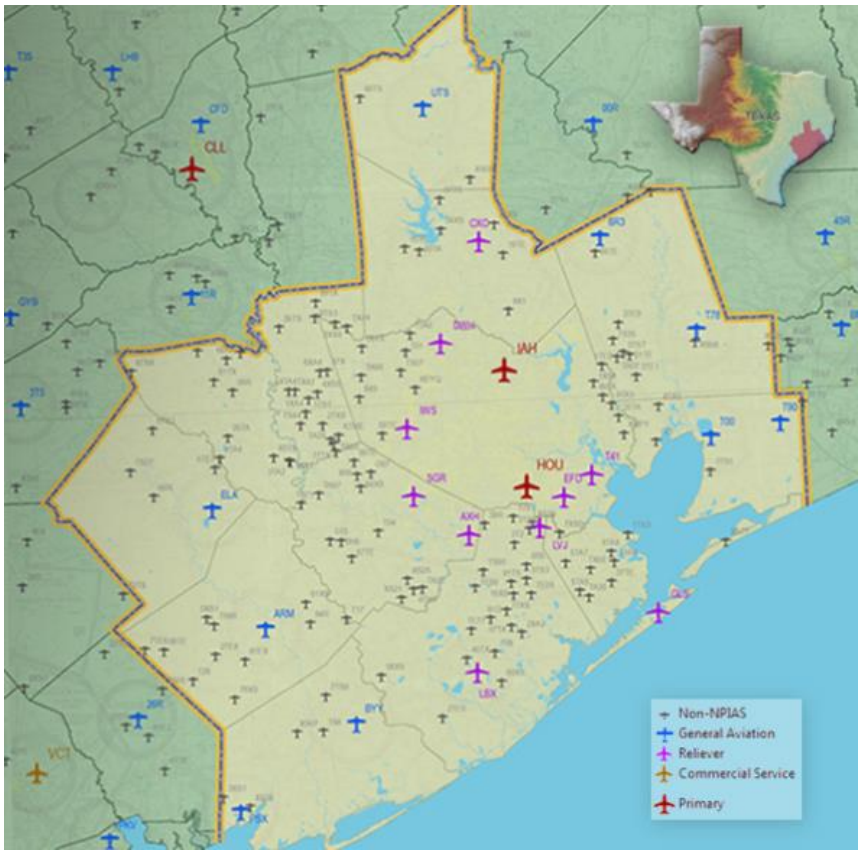
Identify major issues affecting regional aviation.

Develop goals to guide selection of improvement measures and priorities.

Forecast future aviation demand; assess capacity of each airport for aviation activity to 2030.

Explore scenarios of unexpected events that could impact the system.

Figure 10: Airports in the H-GAC Region



Source: Houston-Galveston Area Council, 2011.

Develop plan that establishes airport roles and improves user safety, efficiency, convenience.

Develop list of projects that result in the optimal plan.

Set priorities for projects to form a logical sequence of plan development.

Provide recommendations for updates to the Texas Airport System Plan (TASP) and NPIAS

[45] "Gateways to Our Communities: 2040 Regional Aviation System Plan." Houston-Galveston Area Council, 2011. http://www.h-gac.com/taq/aviation/documents/RASP%20executive%20summary.pdf

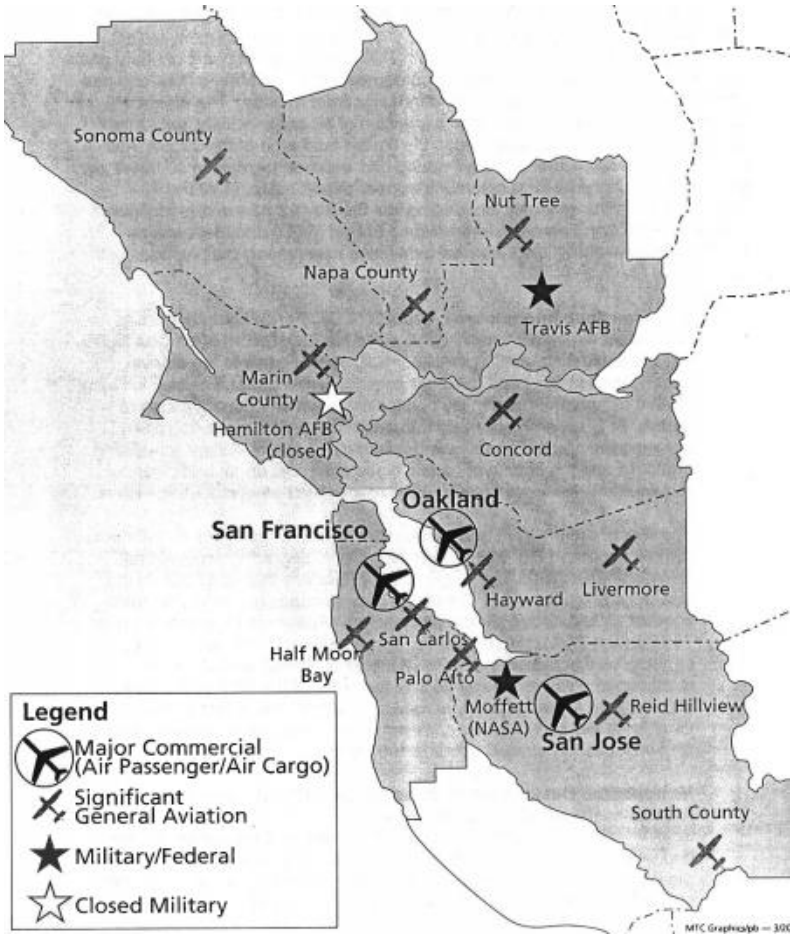
METROPOLITAN TRANSPORTATION COMMISSION (MTC)

Regional Airport System Plan (2000)

The 1999 update of the 1994 RASP was intended to explore a range of solutions to address the increasing air traffic demands being placed on the runways at the major commercial airports and on the airspace around these airports. The decreasing reliability of airline service was also an issue, due to the significant delays experienced at San Francisco International Airport during poor weather. Additionally, San Francisco Airport had initiated its own comprehensive study of runway reconfiguration options, which needed to be considered in a larger regional planning context.[46]

While earlier regional airport planning exercises determined that the region's aviation system capacity would eventually reach its limits, these plans did not provide any detailed analysis of the options for addressing this condition.

Figure 11: Bay Area Airports



Source: Regional Airport Planning Committee, 2000.

The Regional Airport Planning Committee (RAPC) identified three primary issues to focus on:

- The need for additional airport system capacity, now, in 10 years, and in 20 years
- Regional airport system alternatives to provide this capacity
- Significant environmental effects (airport noise, air quality, Bay fill, wetlands/habitats, etc.)

To address these central issues, the RAPC update process provided the following:

- A review of aviation forecasts and update for 2010 and 2020
- A review of the airport system's capacity for major runway alternatives and a sensitivity analysis addressing changes in capacity/delay due to different supply/demand assumptions
- A review of basic environmental impact data on the regional runway
- Alternatives

[46] "Regional Airport System Plan – Update 2000." Regional Airport Planning Committee, 2000. http://bayplanningcoalition.org/downloads/library/Regional_Airport_System_Plan_Update_2000.pdf

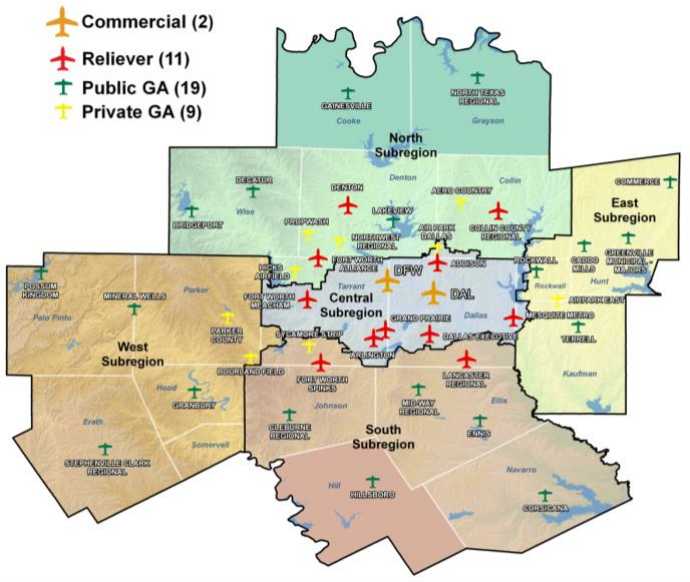
NORTH CENTRAL TEXAS COUNCIL OF GOVERNMENTS (NCTCOG)

General Aviation and Heliport System Plan (2012)

The North Central Texas General Aviation and Heliport System Plan (System Plan) provides guidance and recommendations for the successful future of General Aviation (GA) and Vertical Flight through 2035. The System Plan details the recommended initiatives, by subregion, to ensure adequate and strategic regional aviation capacity to meet future demand requirements.[47]

The System Plan encompasses 19 counties and 35 GA airports. In addition, five commercial airports serve the region. At the time of this study, more than 140 heliports were registered. The region is divided into five subregions, as indicated in the system map below, each with its own needs and unique characteristics.

Figure 12: NCTCOG Airport System Recommended Plan



Source: North Central Texas Council of Governments, 2012.

Forecasting, using a combination of market share and single variable regression analyses, was applied to the following:

- Airside Development Planning
- Landside Development Planning
- Financial Side Planning
- Community Side Planning

NCTCOG offers a pamphlet for use as a tool by local governments, airports, and community organizations to assist in publicizing the roles of airports, how encroachment has detrimentally affected them in the past, and how compatible land-use practices can preserve them for the future.[48]

A new two-part metric was designed to help airport sponsors compare the facility's Airport Community Value (ACV) to other community assets, as well as its importance to the regional and State aviation systems. The ACV metric is subjected to six Value Modifying Factors (VMF), which are:

- Regional Airport Resource
- Airport Protection
- Location/Access
- Business Use Index
- Expandability
- Community Commitment

[47] "North Central Texas General Aviation and Heliport System Plan." North Central Texas Council of Governments, 2012. www.nctaviationplan.com

[48] "A Guide for the Public – Preserving General Aviation Airports in North Texas." North Central Texas Council of Governments, 2012. www.nctcog.org/aviation/outreach

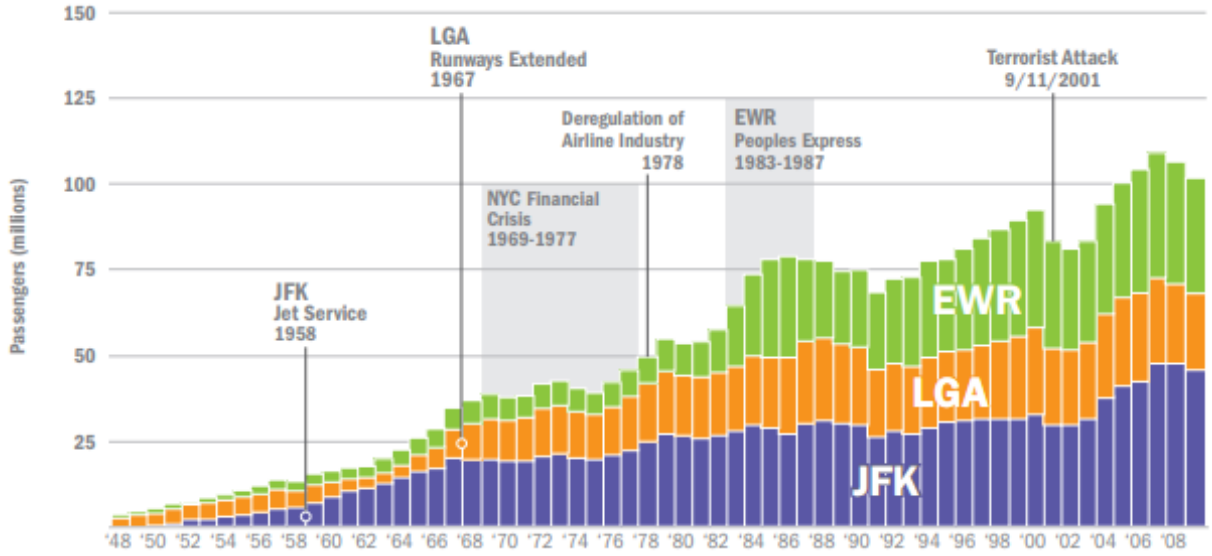
REGIONAL PLAN ASSOCIATION (RPA)

Upgrading to World Class: The Future of the New York Region's Airports (2011)

In Upgrading to World Class: The Future of the New York Region's Airports, the Regional Plan Association (RPA), with support from the Port Authority of New York & New Jersey (PANYNJ), identifies projects and evaluates options that will be required to meet future demand at PANYNJ's three major airports – John F. Kennedy International, Newark Liberty International, and LaGuardia airports.[49]

The study was conducted out of necessity: in 2009 it was estimated that the airports generated 415,000 jobs and $49 billion in economic activity for the region – and that if existing aviation facilities were not expanded or new facilities not built, an estimated 22 million air travelers would not be served by the regional air system by 2030, delays and congestion would worsen, and 125,000 jobs would not be created.

Figure 13: Air Travel Demand at New York Airports: 1948 - 2009



Source: North Central Texas Council of Governments, 2012.

RPA examined sixed categories of potential investments and demand management:

- Implement NextGen I and II
- Encourage the use of outlying airports
- Improve intercity rail service
- Build a new airport
- Manage demand to reduce peak flights
- Expand runway capacity

[49] "Upgrading to World Class: The Future of the New York Region's Airports." Regional Plan Association, 2011. http://library.rpa.org/pdf/RPA-Upgrading-to-World-Class.pdf

SOUTHERN CALIFORNIA ASSOCIATION OF GOVERNMENTS (SCAG)

Regional Transportation Plan 2012-2035: Aviation and Airport Ground Access Appendix

This report was prepared for the 2012 Regional Transportation Plan for Southern California. The report reviews the ground access system serving the region's commercial airports and identifies roadway and public transportation projects to improve airport ground access in the region.[50] The SCAG Aviation Technical Advisory Committee (ATAC) participated in a series of round table discussions over a six-month period to identify regional aviation policy issues that merited further evaluation for inclusion in the 2012 Regional Transportation Plan (RTP).

Figure 14: Commercial and Commuter Airports

Source: Southern California Association of Governments, 2012.

The recommended regional aviation policies and action steps included:

- Regional Aviation Demand, Airport Infrastructure and Airport Ground Access
- Airport Economics, Finance and Funding
- Airport Land Use Compatibility and Environmental Impacts
- Airspace Planning and New Technologies.

[50] "Regional Transportation Plan 2012-2035: Aviation and Airport Ground Access Appendix." Southern California Association of Governments, 2012.

The SCAG Aviation Technical Advisory Committee (ATAC) approved three alternative 2035 regional air passenger demand forecast scenarios for commercial airports, to be considered for potential inclusion in SCAG's 2012–2035 Regional Transportation Plan (RTP). These include baseline/medium growth, low growth, and high growth scenarios.

This report also discusses the characteristics of high occupancy public transportation services that have the potential for attracting air passengers, thereby shifting some away from preferred lower-occupancy modes.

IX. PHASE 1 FINDINGS

The comprehensive Regional Air System Plan (RASP) Phase 1 Report concludes with a synthesis of the state of the practice in regional air systems planning most applicable to the forthcoming Phase 2 and Phase 3 elements of the RASP. Phase 2 of the RASP will review existing conditions in the regional airport system and conduct a needs assessment. The specific areas of assessment in Phase 2 are outlined below, as informed by the work performed in Phase 1. The results of Phase 2 will be documented in a report that will also provide initial guidance for the discussion of forecasts and future recommendations in Phase 3 of the comprehensive RASP update. All three phases will collectively constitute the updated RASP and will include a timeline for incremental updates as well as another future comprehensive update.

Airport Master Plans

Baltimore/Washington International Thurgood Marshall Airport (BWI)

- Concourse A five-gate extension (2019)
- Development of aircraft maintenance facility (forthcoming)
- Introduction of new airlines and service to new air passenger and cargo markets (ongoing)

Ronald Reagan Washington National Airport (DCA)

- Existing Gate 35X renovation into a 14-gate concourse (in progress)
- Construction of new security checkpoint outside of each Metro entrance (2020)
- Significant taxiway relocation, rehabilitation, and construction (2019 – 2023)

Washington Dulles International Airport (IAD)

- Sale of 424-acre Western Lands (2018)
- Noise Contour Map Study (in progress – 2019 completion)
- Completion of the Dulles Corridor Metrorail Project (in progress – 2020 completion)

NPIAS Airports

- Following the Phase 1 NPIAS Airports Inventory, in Phase 2, staff representatives from BWI, DCA, and IAD will indicate which forthcoming airport developments and upgrades will have the most significant implications for the Washington-Baltimore Air Systems Region.

State Aviation System Plans – Washington-Baltimore Region

Maryland

- The 2008 Maryland Aviation System Plan (MASP) anticipates that by 2026, the aviation system will experience an increase of 1,000 based aircraft and 500,000 general aviation operations, as well as 50 percent growth in commercial operations

- The Maryland Aviation Administration conducted a study to estimate the economic impacts of the Maryland aviation system generated by air passenger and air cargo activity

Virginia

- The 2016 Virginia Air Transportation System Plan (VATSP) anticipates that by 2040, almost 210 million air passengers will be added to the aviation system

- Over four billion dollars will need to be invested in Virginia's aviation system by the end of the planning period; the VATSP recommendations include projects programmed in specific years that cannot be funded when needed due to the current funding gap

Adjacent State Aviation System Plans

Delaware

- The 2013 Delaware Aviation System Plan (DASP) poses some key questions that are worth lending consideration to in the Washington-Baltimore Air Systems Planning Region:
    - How has the most recent recession impacted aviation in the region?
    - What impact would the implementation of green technology have on system airports?
    - How would the loss or gain of one or more private airports impact the region?

Pennsylvania

- The 2007 Statewide Airport System Plan (SASP) develops a process to determine which projects provide the greatest benefit to the system based on the operational contribution to the system and on project cost. The process calculates each project's operational contribution to the system and assigned higher weight to projects at busier airports

- A tool was developed to estimate ideal or realistic funding levels tied to typical project implementation timelines and statewide funding demand for any four-year period; this tool provides an estimate of ideal funding levels that are supportable and realistic

West Virginia

- The 2010 West Virginia Multimodal Statewide Transportation emphasizes the economic benefits of the state's aviation system – and in particular – that as the state transforms from a coal mining economy into a tourism, service, aerospace industry, and technology-based economy, access to aviation facilities and services will be key to fostering economic growth

ACRP Reports on the State of Practice

Airport System Planning Practices (2009)

- Highlights various elements or special studies that could be included in the planning effort
- Includes ways that plans are being used and implemented

Airport Curbside and Terminal Area Roadway Operations (2010)

- Includes a quick analysis tool for curbside operations and low-speed roadway weaving area
- Highlights techniques for estimating traffic volumes

Developing an Airport Performance-Measurement System (2010)

- Provides guidance on developing and implementing performance-measurement systems

Handbook to Assess the Impacts of Constrained Parking at Airports (2010)

- Explores different types of parking constraints that airports experience and highlights tools to assess the impacts of the constraints and strategies to deal with them

Exploring Airport Employee Commute and Parking Strategies (2012)

- Addresses alternatives to the drive alone commute for airport employees, the effectiveness and challenges of airport employee commute options programs, and commute options programs offered by non-airport employers with potential airport environment applicability

Commercial Ground Transportation at Airports: Best Practices (2015)

- Shares potential solutions to ground transportation-based challenges airport operators frequently face, how to select a solution, and how to implement the selected best practice

Innovative Revenue Strategies – An Airport Guide (2015)

- Identifies: Customer needs - airport-provided services and shared services, facilities, and equipment; Revenue participation in real estate and natural resource development; Value capture and other financing opportunities; Improvements to existing airport businesses

Estimating Truck Trip Generation for Airport Cargo Activity (2017)

- Assists communities in planning and investing appropriately by accounting for air cargo's impacts; Helps ensure cargo facility truck access and egress remains reliable and safe

Transportation Network Companies: Challenges and Opportunities for Airport Operators (2017)

- Compiles experiences and effective practices by airports in facilitating customer access to Transportation Network Companies (TNCs) like Uber and Lyft

- Summarizes the amount of revenue airports receive from TNCs and how TNCs are affecting airport operations and other businesses

National Case Studies

DVRPC

- Preserves the existing public-use General Aviation airport system
- Expands community outreach to inform the public of the economic impact of airports
- Improves efforts to attract students to careers in aviation fields

H-GAC

- Explores scenarios of unexpected events that could impact the regional aviation system
- Develops "optimal plan" to improve user safety, efficiency, and convenience

MTC

- Identifies current airport system capacity needs, as well as on 10 and 20-year forecasts
- Addresses significant environmental effects of airport expansion and air service delivery, such as airport noise, air quality, Bay fill, wetlands/habitats, etc.

NCTCOG

- Offers pamphlet for publicizing the roles of airports and compatible land use practices
- Introduces a metric for comparing the facility's Airport Community Value to other assets

RPA

- Examines six categories of potential investments and demand management

SCAG

- Recommends regional aviation policies and action steps concerning emerging technologies
- Develops three scenarios for the regional air passenger demand forecast: baseline/medium growth, low growth, and high growth
- Identifies the characteristics of high occupancy public transportation services with the potential to attract air passengers away from lower-occupancy modes

PHASE 2

Phase 2 of the comprehensive RASP update reviewed existing conditions (supply) and anticipated needs (demand) in the regional airport system. The results of Phase 2 inform the airport-specific needs assessment and air system-wide policy issue recommendations that will be outlined in Phase 3.

Phase 2 addresses supply and demand as follows:

Supply Analysis
Conduct a supply analysis for the region's commercial airports covering passenger and cargo facilities and other uses within the airport boundaries, using a similar approach to that performed for the Ground Access Element Update in previous Airports Capital Improvement Plan (ACIP) documents.

Demand Analysis
Conduct a demand analysis for the region's commercial airports covering passenger and cargo facilities and other uses within the airport boundaries, using an approach similar to that performed for the Ground Access Element Update in previous ACIP documents and including a review of outputs from regional and statewide travel demand forecasting models, where available. The analysis will cover demand for air travel and surface transportation for the airports.

I. AIRPORT MASTER PLANS

An airport master plan is a detailed, long-term development plan for an individual airport.[51] Airport master plans are prepared to support the modernization or expansion of airports. As demonstrated in this section's summaries of the master plans for each of the region's three major commercial airports, the airport master planning effort involves collecting data, inventorying existing facilities, forecasting demand, determining facility requirements, evaluating alternative development plans, detailing long-range development plans and financial implementation schedules for a specific airport, and preparing an Airport Layout Plan (ALP).

The approved ALP is a key deliverable of the master planning process, serving as a record of aeronautical requirements, both current and future, and as a reference for local community deliberations on land use and zoning proposals as well as budget issues. The FAA requires all federally funded airports to have an FAA-approved ALP in place, which is typically updated and submitted to the FAA for approval every five years or as needed. The ALP should reflect an accurate depiction of existing and future proposed conditions in the airside, landside, and terminal areas, as well as proposed development over the near, interim and long-term planning horizons.[52]

According to a 2016 Washingtonian article – and as further articulated in the Washington-Baltimore Regional Air Passenger Survey 2017 General Findings results below – it's a close race for passengers among the region's three airports, with all three planning major upgrades in order to attract more air passengers and improve the airport experience, from the security checkpoints to the food court.[53] Many of these changes are reflected in the airport master plan descriptions within this section.

In 2017, 36.4 million passengers traveled through the Washington-Baltimore Region, an increase of seven percent from 2015 (34.1 million).[54] This total is broken down by the percentage of passengers at each airport:

- 36 percent of passengers at BWI (up from 35 percent in 2015)
- 33 percent of passengers at DCA (down from 34 percent in 2015)
- 31 percent of passengers at IAD (the same as in 2015)

[51] "Advisory Circular: The Airport System Planning Process." U.S. Department of Transportation Federal Aviation Administration, 2015.
[52] "Recommendation to Approve an Update to the Airport Layout Plan for Ronald Reagan Washington National Airport." Metropolitan Washington Airports Authority, 2017. http://www.mwaa.com/sites/default/files/BOD/2017-01/tab_5_recommendation_to_approve_an_update_to_the_airport_layout_plan_for_ronald_reagan_washington_national_airport.pdf
53 "Future of DC Airports – New Construction DCA BWI IAD." The Washingtonian, 2016. https://www.washingtonian.com/2016/11/21/future-of-dc-airports-new-construction-dca-bwi-iad/
54 "Washington-Baltimore Regional Air Passenger Survey – 2017 General Findings." National Capital Region Transportation Planning Board, Metropolitan Washington Council of Governments, 2018.

BALTIMORE/WASHINGTON INTERNATIONAL THURGOOD MARSHALL AIRPORT (BWI)

Consolidated Transportation Program (2018–2023, 2019–2024)

In 2017, a record 26.3 million enplaning air passengers flew through BWI – 1.4 million more than the previous year. To accommodate the airport's growth, the Maryland Aviation Administration (MAA) continues improving its facilities and passenger amenities, as outlined in the forthcoming Maryland Department of Transportation Consolidated Transportation Plan 2019 - 2024 (MDOT CTP).[55]

Following the installation of a new International Checked Baggage Inspection System in 2017, a six-gate expansion of the International Concourse will open to the public in fall 2018, enhancing Customs processing for arriving travelers. Reconstruction of 28,000 square yards of concrete apron pavement surrounding Concourse B is underway and the design of a five-gate extension to Concourse A is nearing completion. In early 2019, construction will begin on the 55,000 square foot, five-gate extension to Concourse A, which serves Southwest Airlines. This is an important first step in a multi-year upgrade to Terminal A/B, which is the center of operations for Southwest Airlines at BWI.

Over the past year, BWI air cargo activity grew by approximately 60 percent. The airport responded to this rapid growth with a fast-track construction project, expanding the Midfield Cargo Apron with three new aircraft parking positions – for a total of six – to accommodate growth by an existing carrier in time for peak 2017 holiday season demand.

At BWI, airlines need to perform periodic or incidental maintenance on their aircraft. Currently there is insufficient space at the airline gates or within the terminal and adjacent areas for airlines to perform aircraft maintenance functions. The forthcoming creation of an Aircraft Maintenance Facility will support aircraft maintenance needs.[56]

With support from the Maryland Department of the Environment (MDE), MAA procured twenty new articulated shuttle buses powered by clean natural gas (CNG) for transportation between the BWI terminal and the consolidated rental car facility. For those travelers seeking the highest level of convenience, "concierge-style" valet parking was launched in the hourly garage in early 2018.

Environmental Assessment of Airport Layout Plan Phase 1 (2016–2020)

In April of 2015 the FAA conditionally approved the Airport Layout Plan (ALP) for BWI. The 2015 ALP identified three phases of improvements at BWI, which are key to meeting FAA design standards as well as the airport's own capacity demands. Phase 1 (2016-2020) is the primary element of the ALP under consideration in the Environmental Assessment and Section 4(f) Determination recently undertaken by the Office of Environmental Services at MAA.[57] The purpose of each element of Phase 1 and its associated projects are outlined below:

[55] "Draft Consolidated Transportation Program 2019 to 2024." Maryland Aviation Administration, Maryland Department of Transportation, Publication forthcoming: 2019.
[56] "Consolidated Transportation Program 2018 to 2023." Maryland Aviation Administration, Maryland Department of Transportation, 2018.
[57] "Proposed Improvements 2016-2020 at Baltimore/Washington International Thurgood Marshall Airport: Draft Environmental Assessment and Draft Section 4(f) Determination." Office of Environmental Services, Maryland Aviation Administration, Maryland Department of Transportation, 2018. http://www.marylandaviation.com/_media/client/environmental/2018/Draft_EA_and_Section4(f)_Determination_Proposed_Improv_2016_2020_BWI_v2.pdf

Meet FAA Design Standards

- Improve taxiway fillets/shoulders in the International Terminal Area
- Construct new infill pavement near Taxiways T, P and 'Future P' (Runway 4-22 has been converted to Taxiway P but was previously referred to as Future P)
- Relocate Taxiway K and Re-establish Taxiway L
- Relocate Taxiways R and F
- Relocate Taxiway V
- Expand Runway 28 Deicing Pad
- Remove Part 77 Obstructions: for on airport property clear the primary, approach (50:1) and transition surfaces; for off-airport properties clear to the threshold siting surface (34:1)
- Clear trees in the VORTAC critical area to a 1,200-foot radius

Enhance Airfield Safety and Efficiency

- Construct Taxiway U3
- Relocate Taxiway H
- Construct Isolation/ Remain Overnight (RON) Apron
- Construct Northwest Quadrant Perimeter Road
- Construct vehicle service roadway (VSR) connector south of the former Runway 4 end
- Expand existing ARFF indoor parking
- Relocate fire training facility
- Rehabilitate/improve pavement in accordance with the latest Pavement Management Plan

Accommodate Existing and Anticipated Demand

- Expand Runway 15R Deicing Pad
- Construct Second FBO
- Construct new Northrop Grumman Hangar
- Construct new airline maintenance facility
- Increase runway deicing chemical storage and construct access road
- Building 113 Demolition
- Relocate and consolidate airport maintenance complex

Improve Customer Service

- Construct new Sky Bridge C
- Widen terminal roadway
- Widen upper level roadway at Concourse E

NEPA Review of Previously Acquired Property

- Perform NEPA review of acquired parcel located at 1143 Stoney Run Road

RONALD REAGAN WASHINGTON NATIONAL AIRPORT (DCA)

Reagan National Project Journey

The current facilities at Ronald Reagan Washington National Airport (DCA) were designed to serve 15 million enplaning passengers per year. However, 23.9 million enplaning passengers traveled through the airport in 2017, setting new records and straining the existing infrastructure. To accommodate this level of passenger traffic and provide an improved level of service, a series of projects are underway.

Project Journey is a $1 billion major development program that includes two key projects: new security checkpoints and a new concourse. The program is estimated to be completed in 2021.[58]

New Concourse

The new concourse will replace the 14 hardstand gates currently accessed via bus from Gate 35X. Contact gates with enclosed access to planes via jet bridges, spacious hold rooms, new concessions and an American Airlines Admirals Club lounge will be provided. The facility will increase safety and security, as well as enhance passenger convenience. It will end the need for travelers to ride buses from the terminal to board regional jets parked outside. The concourse design includes architectural features consistent with Terminal B/C's exposed metal beams, glass walls and domed ceilings while maximizing open, navigable gate areas and panoramic views of downtown Washington, D.C.

New Security Checkpoints

The new security checkpoints will be conveniently located between National Hall and walkways from the Metrorail station and parking garages. Upon activation, the new 50,000 square foot checkpoints will expand screening capacity from 20 to 28 security lanes and create a seamless, free-flowing environment between Terminal B/C (Gates 10-45).

By relocating the existing security checkpoints, passengers will be able to move freely between gate areas and enjoy all the amenities the airport offers without having to be re-screened. The resulting terminal reconfiguration will provide passengers an improved post-security experience — alleviating gate area congestion while expanding access to a variety of shopping, dining and seating options. The two new security checkpoints will be built above the existing arrivals roadway.

Airport Capital Improvement Plan, Ronald Reagan Washington National Airport, 2019 – 2023

In addition to Project Journey, various airfield improvements are underway or planned. A pavement rehabilitation project for various taxiways and Runway 4/22 is nearing completion. Expansion of Hold Bay 04 including deicing collection and storage facilities is scheduled to begin in October 2018.

Planned airfield improvements in the Airport Capital Improvement Plan (ACIP) for Reagan National Airport include taxiway geometry projects to meet FAA standards and reduce the likelihood of runway incursion, hold bay reconfiguration, and pavement rehabilitation projects. Detailed projects by year are provided below.

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[58] "Reagan National Project Journey." Ronald Reagan Washington National Airport, 2018. **http://flyreagan.com/dca/project-journey**

Air Capital Improvement Plan Projects Listed by Year:

2019

- **Construct Taxiway, J, A, C, E** (South Airfield Geometry Improvements TV-900 Electric Vault Relocation – Phase I): The relocation of the TV-900 electrical Vault is an enabling project to allow for the reconfiguration of Hold Bay 01. The project will also increase the resiliency of the vault at the south end of the Airport.

2020

These pavement rehabilitation projects are part of the ongoing pavement management program:

- **Rehabilitate Taxiways J, M, N, and N1**
- **Rehabilitate Taxiway and Apron – South GA Apron & Taxiway Papa West**

2021

- **Construction Taxiway J, A, C, E** (South Airfield Geometry Improvements Taxiway and RWY 01 Hold Apron – Phase 2): Includes the reconfiguration of the Runway 01 hold bay to meet FAA standards. In addition, the project includes deicing collection and storage facilities.

- **Expand Runway 15 Hold Bay and Rehabilitate Runways 15 and 22 Hold Bays:** Will reconfigure the Runway 15 hold bay to increase efficiency at the north end of the airport. It is also part of the ongoing pavement management program.

2022

- **Construct Taxiway J, K, N** (RIM and Hot Spot 2 Taxiway Geometry Improvements Taxiway and Hold Apron and Relocate N Phase 1): Will address the non-standard taxiway geometry associated with the FAA identified Runway Incursion Mitigation (RIM) location (Runway 19 hold bay) and Hot Spot 2. The project will meet taxiway design standards and help to decrease the likelihood of runway incursions. Runway guard lights will also be installed at Hot Spot 2 to increase pilot situational awareness.

2023

- **Relocated Taxiway N Phase II:** This project is to comply with the runway to taxiway separation distance between Taxiway N and Runway 15/33.
- **Rehabilitate Apron – Terminal B/C Ramps:** Part of ongoing pavement management program
- **Rehabilitate Apron – Terminal A Apron:** Part of ongoing pavement management program

Airport Layout Plan

The Airport Layout Plan (ALP) for Reagan National was approved by the MWAA board in January 2017 and was approved by the FAA in 2018. The update incorporates all Runway Safety Area work that was completed in previous years and all pen and ink change approvals since the last update (2012), including the Project Journey new concourse and checkpoints. New development items include the revision of planned roadway improvements, associated enabling projects (new Engineering and Maintenance Shops Building and temporary parking structure) and airfield improvements to address the Runway Incursion Mitigation (RIM)/ Hot Spot nonstandard taxiway geometry, Runway 04 Hold Bay expansion and Runway 01 Hold Bay improvements.

WASHINGTON DULLES INTERNATIONAL AIRPORT (IAD)

Airport Capital Improvement Plan, Washington Dulles International Airport, 2019 – 2023

Washington Dulles International Airport served over 22.7 million enplaning passengers in 2017, a 4.1 percent increase over the previous year. The increase was largely due to the addition of new International Airlines and destinations. This trend is anticipated to fuel continued growth in 2018. Many of the current projects at Dulles are for maintenance and/or enhancement of existing facilities. Near-term capital improvements consist of upgrades to existing concourses that will extend their useful life. Projects range from new roofing to electrical, plumbing, and new finishes. Other improvements consist of aircraft fueling system upgrades, pavement rehabilitation for aircraft parking aprons, taxiways, taxi lanes and runways, and baggage system upgrades to provide additional capacity. A small number of additional narrow body aircraft gates are envisioned that will enable existing gates to be converted to accommodate widebody aircraft.

In addition, MWAA continues to rehabilitate the pavement at the airport as part of the ongoing pavement management program and bring the airfield up to Aircraft Design Group (ADG) VI and Taxiway Design Group (TDG) 7 standards. Rehabilitation of a portion of Taxiway J and Taxi-lane B west section rehabilitation and widening are anticipated to be completed this fall. Additional airfield pavement rehabilitation projects planned are listed below.

Air Capital Improvement Plan Projects Listed by Year:

2019

- **Reconstruct & Wide Taxi Lane B, Middle, Section 2:** Will widen Taxi Lane B to 84 feet to meet TDG-7 standards; will be the final phase of the Taxi Lane B rehabilitation and widening.

2020

- **Reconstruct North Runway 1C-19C & High-Speed Taxiways:** Will rehabilitate original pavement on the northern portion of the Runway 1C/19C. Note the southern portion of the runway was rehabilitated several years ago.

2021

- **Reconstruct Runway 1R-19L (Phase 1 Design):** This project is for the design of a complete rehabilitation and widening of the Runway 1R/19L. The original pavement panels will be replaced, and the runway widened to 200 feet to accommodate Design Group VI aircraft.

- **Reconstruct Apron B Gates, SE End, Sections 3 & 4:** This project is part of the ongoing pavement management program.

2022

These projects are part of the ongoing pavement management program:

- **Reconstruct Apron B Gates, SW End, Sections 1 & 2**
- **Reconstruct Taxiway Y Section 5**

2023

- **Reconstruct Taxi Lane A:** Part of the ongoing pavement management program.

Dulles Corridor Metrorail Project: Section 106 Activities Annual Report

In 2017, the Metropolitan Washington Airports Authority (MWAA), and a number of local stakeholders - including the Virginia Department of Transportation (VDOT), the Washington Metropolitan Area Transit Authority (WMATA), Fairfax County, Loudoun County, and the Virginia Department of Rail and Public Transportation (DRPT) – continued planning, development, design and construction activities for the Project, a 23.1-mile extension of the regional Metrorail system along the rapidly growing Dulles Corridor in Fairfax and Loudoun Counties.[59] The Project extends the 106-mile Metrorail system existing in 2007 from the Metrorail Orange Line in Fairfax County through Tysons Corner to the Washington Dulles International Airport (Dulles Airport) and beyond to Route 772 in eastern Loudoun County. Most of the extension is being constructed in the median of the Dulles Connector Road, the Dulles International Airport Access Highway (DIAAH), and the Dulles Greenway toll road, but the alignment also diverts off median to directly serve Tysons Corner and Dulles Airport. The entire extension, once completed, will include 11 new Metrorail stations, a maintenance and storage yard on Dulles Airport property, and an expansion of the existing service facilities at the West Falls Church Station. Four of the new stations are located within Tysons Corner because it offers the significant ridership potential with the least impact on residential areas.

The Project's first phase, known as the Extension to Wiehle Avenue, completed the initial 11.7 miles of the planned extension from the current Metrorail Orange Line to Wiehle Avenue in Reston. The alignment follows the Dulles Connector Road, Route 123 and Route 7 in Tysons Corner, and the DIAAH. The Extension to Wiehle Avenue includes five new stations (McLean, Tysons Corner, Greensboro, Spring Hill, and Wiehle-Reston East), additional commuter parking, improvements to the existing Metrorail Service and Inspection Yard at West Falls Church, and an interim terminus at Wiehle Avenue. Construction was substantially completed in spring 2014 and revenue operations of the Extension to Wiehle Avenue commenced on July 26, 2014.

The Project's second phase, known as the Extension to Dulles Airport/Route 772, will complete the Project from the Phase 1 terminus at Wiehle Avenue to Route 772 in Loudoun County. From Wiehle Avenue, the alignment will continue along the DIAAH, cross Dulles Airport property, and then follow the Dulles Greenway to the terminus at Route 772. The Extension to Dulles Airport/Route 772 will include six additional stations (Reston Town Center, Herndon, Innovation Center, Dulles Airport, Loudoun Gateway, and Ashburn), additional commuter parking, and a new Service and Inspection Yard on Dulles Airport property. Revenue operations of the Extension to Dulles Airport/Route 772 is tentatively scheduled for some time in 2020.

Airport Layout Plan

The Airport Layout Plan for Dulles was last updated in July 2016. It included property boundary changes and various projects that were recently completed or planned.

[59] "Dulles Corridor Metrorail Project: Section 106 Activities Annual Report." Metropolitan Washington Airports Authority, 2018. http://www.dullesmetro.com/silverline/assets/File/project_docs/2017%20Section%20106%20Activities%20Annual%20Report%20-%20FINAL.pdf

II. SUPPLY ANALYSIS

The following metrics were established to guide the supply analysis. The development of the supply-based metrics was informed by an iterative series of in-person interviews and phone calls conducted by TPB staff with airport planning staff from each of the region's three major commercial airports: Baltimore/Washington International Thurgood Marshall Airport (BWI), Ronald Reagan Washington National Airport (DCA), and Washington Dulles International Airport (IAD)

AIR SERVICE

The total number of aircraft gates, including both wide body gates and narrow body gates.

CARGO

Air cargo consists of four elements: apron space, warehouse space, landside space (truck maneuvering and parking), and intermodal connectivity. Apron space involves square footage of apron or number of wide-body and narrow-body parking positions. Warehouse space consists of the square footage of existing cargo warehouse space. Landside space involves truck maneuvering and parking. Intermodal connectivity includes factors that impact access to the interstate highway system and cargo rail.

GROUND ACCESS

Ground access is broken down by roadway infrastructure and the number of routes, capacity, and frequency of the following transit services: Metrorail, Metrobus or other local bus, commuter bus, commuter rail, intercity bus, and intercity rail.

CURBSIDE ACCESS

Curbside access is primarily defined by lane area and lane capacity, where lane area consists of the linear footage of lanes, and lane capacity involves the curbside capacity of lanes in terms of level of service (LOS) and/or the number of vehicles that the lanes can accommodate over the course of a year.

PARKING

Parking is defined by the number of parking spaces.

GENERAL AVIATION FACILITIES

General aviation facilities consist of three elements: apron space, hangar space, and general aviation terminal and fixed-base operator (FBO) facilities. Apron space involves the square footage of the apron, hangar space consists of the total units of corporate/group and T hangars, and general aviation terminal and FBO facilities are measured in square footage.

SUPPLY ANALYSIS FOR BALTIMORE/WASHINGTON INTERNATIONAL THURGOOD MARSHALL AIRPORT (BWI)

AIR SERVICE

The total number of aircraft gates, including both wide body gates and narrow body gates. Air service infrastructure at BWI Airport consists of 12 wide body gates and 62 narrow body gates.

CARGO

Air cargo consists of four elements: warehouse space, apron space, landside space (truck maneuvering and parking), and intermodal connectivity. Apron space involves square footage of apron or number of wide-body and narrow-body parking positions. Warehouse space consists of the square footage of existing cargo warehouse space. Landside space involves truck maneuvering and parking. Intermodal connectivity includes factors that impact access to the interstate highway system and cargo rail.

Warehouse Space

There is 412,125 SF of existing cargo warehouse space.

Figure 15: Apron Space and Landside Space (BWI)

Aircraft Parking Spaces	Midfield cargo	**12**	North cargo	**20**	Total	**32**
Runway Length	RW10-28	**10,502' x 150'**	RW15R-33L	**9,500'x150'**	RW15L-33R	**5,000'x100'**
Ramp Area	Midfield cargo	**785,000 SF**	North cargo	**1,317,000 SF**		
Truck Maneuvering	Landside frontage	**4,182 LF**	Maneuvering	**527,856 SF**		
Truck Parking	Dock positions	**251**	Storage	**459,000 SF**		

Source: *BWI Airport, 2020*

Intermodal Connectivity

Primary access to the interstate highway system from the north, northwest, and northeast is provided via Interstates 95, 695, and 195, and MD 295. Access is also provided from the east via US 50/301 to I-97, from the south via I-495, and via Interstate 70, MD Route 100, and the Intercounty Connector / MD 200.

GROUND ACCESS

Ground access is broken down by roadway infrastructure and the number of routes, capacity, and frequency of the following transit services: Metrorail, Metrobus or other local bus, commuter bus, commuter rail, intercity bus, and intercity rail. For roadway access, see the intermodal connectivity outlined in the section above.

Figure 16: Metrobus / Local Bus (BWI)

Routes	B-30 Greenbelt-BWI Airport Express Line
Capacity	50 passengers per bus
Frequency	Hourly Monday-Friday; 6 AM - 10:38 PM

Source: *BWI Airport, 2020*

Figure 17: Commuter Bus (BWI)

Routes	201 Gaithersburg Park to BWI
Capacity	50 passengers per bus
Frequency	Hourly 4 AM - 12:20 AM

Source: *BWI Airport, 2020*

Figure 18: Commuter Rail (BWI)

Routes	MARC Penn Line
Capacity	Sitting Load: 875; Crush Load: 1,155
Frequency	
Weekday: Southbound	4 AM – 9:25 PM; 27 daily trips
Weekday: Northbound	5:30 AM – 10:45 PM; 24 daily trips
Saturday: Southbound	7 AM – 9:15 PM; 9 daily trips
Saturday: Northbound	9 AM – 10:45 PM; 9 daily trips
Sunday: Southbound	8:45 AM – 5:55 PM; 6 daily trips
Sunday: Northbound	10:30 AM – 7:30 PM; 6 daily trips

Source: *BWI Airport, 2020*

Figure 19: Intercity Bus (BWI)

Routes	LocalLink 75 & Express BusLink 107
Capacity	50 passengers per bus
Frequency	
LocalLink 75	Daily; 24 hours per day
Express BusLink 107	
Weekday	6:20 AM - 9:01 AM
Weekend	3:50 PM - 6:31 PM

Source: *BWI Airport, 2020*

Figure 20: Intercity Rail (BWI)

Routes	Baltimore Light RailLink
Capacity	250 passengers per car; 2-car train
Frequency	
Weekday	4:01 AM-1:23 AM; every 10-30 minutes
Saturday	4:21 AM-1:23 AM; every 15-30 minutes
Sunday	9:51 AM-10:06 PM; every 15-30 minutes

Source: *BWI Airport, 2020*

CURBSIDE ACCESS

Curbside access is primarily defined by lane area and lane capacity, where lane area consists of the linear footage of lanes, and lane capacity involves the curbside capacity of lanes in terms of level of service (LOS) and/or the number of vehicles that the lanes can accommodate over the course of a year.

At BWI Airport, the existing linear feet of curbside can accommodate 30 million annual passengers.

Figure 21: Lane Area (BWI)

Arrivals	7 lanes
Outer Curb	2,300 linear feet
Inner Curb	2,600 linear feet
Departures	6 lanes
Outer Curb	2,200 linear feet
Inner Curb	2,600 linear feet

Source: *BWI Airport, 2020*

Curbside Access by Type

- **Private vehicles**
- **Transportation Network Companies**
- **Taxicabs**
- **Airport shuttles**
- **Dedicated commercial**

PARKING

Parking is defined by the number of parking spaces: 417,600.

Parking by Type

- **Public/Customer**
- **Employee**
- **Cell Phone**
- **Transportation Network Companies**

GENERAL AVIATION FACILITIES

General aviation facilities consist of three elements: apron space, hangar space, and general aviation terminal and fixed-base operator (FBO) facilities. Apron space involves the square footage of the apron, hangar space consists of the total units of corporate/group and T hangars, and general aviation terminal and FBO facilities are measured in square footage.

Figure 22: Apron Space (BWI)

Transient Aircraft Overflow Parking	10,000 square yards
RW 15L-33R Deicing Pad	13,000 square yards
Transient Aircraft Parking Apron	66,500 square yards
Based Aircraft Parking Apron	40,500 square yards

Source: *BWI Airport, 2020*

Apron Parking Space

132,500 square yards (1,192,500 SF)

Figure 23: Hangar Space (BWI)

General Aviation Aircraft	70
T Hangars	30
Corporate Hangars	10

Source: *BWI Airport, 2020*

SUPPLY ANALYSIS FOR RONALD REAGAN WASHINGTON NATIONAL AIRPORT (DCA)

AIR SERVICE

The total number of narrow body aircraft gates. Air service infrastructure at DCA Airport consists of 47 narrow body gates.

CARGO

Air cargo consists of four elements: warehouse space, apron space, landside space (truck maneuvering and parking), and intermodal connectivity. Apron space involves square footage of apron or number of wide-body and narrow-body parking positions. Warehouse space consists of the square footage of existing cargo warehouse space. Landside space involves truck maneuvering and parking. Intermodal connectivity includes factors that impact access to the interstate highway system and cargo rail.

Warehouse Space

47,700 SF of existing cargo warehouse space exists in one cargo building with no airside access for aircraft. There are other non-cargo related tenants utilizing 16,105 SF of the warehouse space, but it can be fully utilized for cargo purposes if the need should arise in the future.

Figure 24: Apron Space and Landside Space (DCA)

Aircraft Parking Area	Air Cargo Facility	0				
Runway Length	R/W 1-19	7169' x 150'	R/W 15-33	5204' x 150'	R/W 4-22	5000' x 150'
Ramp Area	Air Cargo Facility	0				
Truck Parking	Dock Positions	58	Landside Frontage		Truck Maneuvering	60492 SF

Source: *Metropolitan Washington Airports Authority, 2020*

Intermodal Connectivity

Primary access to the interstate highway system in Virginia is provided from Richmond and points south via I-95 North to I-395 North and from Manassas and points west via I-66 East and VA 110 South to US 1 South. When traveling from Maryland, DCA Airport can be accessed via I-95 South, I-270 South, I-495 South, and I-395 South.

GROUND ACCESS

Ground access is broken down by roadway infrastructure and the number of routes, capacity, and frequency of the following transit services: Metrorail, Metrobus or other local bus. For roadway access, see the intermodal connectivity outlined in the section above.

Metrorail

The blue and yellow Metrorail lines are connected to the concourse level of Terminals B and C at Reagan National Airport. Metro begins operation at 5 a.m. on weekdays, 7 a.m. on Saturdays, and 8 a.m. on Sundays. Service ends at 11:30 pm Monday through Thursday, 1 a.m. on Fridays and Saturdays, and 11 p.m. on Sundays.

Metrobus / Local Bus – No Metrobus service at DCA.

Commuter Bus – No commuter bus service to DCA.

Commuter Rail – The nearest commuter rail stop to DCA is the VRE Crystal City Station. VRE passengers can disembark at Crystal City and transfer to the Crystal City Metrorail station and continue their ground access trip to DCA. The nearest commuter rail station for Maryland's MARC commuter rail service is Union Station. MARC passengers can disembark at Union Station and transfer to the Union Metrorail station and continue their ground access trip to DCA.

Intercity Bus – No intercity bus service to DCA.

Intercity Rail – No intercity rail service to DCA.

CURBSIDE ACCESS

Curbside access is primarily defined by lane area and lane capacity. Lane area consists of the linear footage of lanes, and lane capacity involves the curbside capacity of lanes in terms of level of service (LOS) and/or the number of vehicles that the lanes can accommodate over the course of a year.

At DCA, there is a total of 5,705 linear feet of curbside.

Figure 25: Lane Area (DCA)

Terminal A		Terminal B/C	
Arrivals / Departures	7 lanes	**Arrivals**	8 lanes
Outer Curb	460 linear feet	**Outer Curb**	1560 linear feet
Inner Curb	655 linear feet	**Inner Curb**	1400 linear feet
		Departures	5 lanes
			1630 linear feet
Total Curb: 5,705 linear feet			

Source: *Metropolitan Washington Airports Authority, 2020*

Rental Car Facility

A Rental Car facility occupies 3 levels of Garage A and is walkable from the terminal facilities. The total square feet utilized by rental car operations is 931,800 sf.

Curbside Access by Type

- **Private vehicles:** 2020 LF for Arrivals (Shared with Transportation Network Companies [TNCs], i.e. Uber and Lyft).
- **Transportation Network Companies:** 2020 LF for Arrivals (Shared with POVs)
- T**axicabs:** 790 LF
- **Airport shuttles:** 575 LF
- **Dedicated commercial:** 690 LF

PARKING

Parking is defined by the number of parking spaces: 12,212

Figure 26: Parking Spaces by Type (DCA)

Garage (Short-Term)	6,303
Economy (Long-Term)	2,613
Employee	3,296
Total Parking Spaces: 12,212	

Source: *Metropolitan Washington Airports Authority, 2020*

Temporary Parking

During DCA's current construction there is not currently a cell phone lot available. As such, the first 60 minutes in the garages are free to accommodate cell phone passenger pickup. For TNCs, there is a 100-space staging lot located adjacent to the airport.

GENERAL AVIATION FACILITIES

General aviation facilities consist of three elements: apron space, hangar space, and general aviation terminal and fixed-base operator (FBO) facilities. Apron space involves the square footage of the apron; hangar space consists of the total units of corporate/group and T hangars; and general aviation terminal and FBO facilities are measured in square footage.

Figure 27: Apron Space (DCA)

Transient Aircraft Parking Apron (South Hangar Area)	337,000 SF*
Hold Bay 04 Deicing Apron	128,560 SF*
Apron Area Adjacent to Hangars 3 thru 6	222,676 SF

**Transient Aircraft Parking Apron & Hold Bay 04 Deicing Apron mainly used for air carrier operations for overnight parking.*
Source: *Metropolitan Washington Airports Authority, 2020*

Hangars/Office Space

Six hangars make up 444,524 square feet, 26,700 square feet of which is used for snow removal equipment storage. All other hangars are utilized for aircraft/airport support services.

General Aviation Terminal and FBO Facilities

One fixed-base operator (FBO) serves general aviation at DCA. It has a total terminal and office space of 76,913 square feet and an FBO apron space of 60,952 square feet.

SUPPLY ANALYSIS FOR WASHINGTON DULLES INTERNATIONAL AIRPORT (IAD)

AIR SERVICE

Air service is defined as the total number of aircraft gates, including both wide body gates and narrow body gates. Air service infrastructure at IAD Airport contains 34 wide body gates and 74 narrow body gates.

CARGO

Air cargo consists of four elements: warehouse space, apron space, landside space (truck maneuvering and parking), and intermodal connectivity. Apron space involves square footage of apron or number of wide-body and narrow-body parking positions. Warehouse space consists of the square footage of existing cargo warehouse space. Landside space involves truck maneuvering and parking. Intermodal connectivity includes factors that impact access to the interstate highway system and cargo rail.

Warehouse Space

There is a total of 476,502 square feet of existing cargo warehouse space. Additionally, 34,901 square feet of office space is located within the cargo buildings on the upper levels. There are other non-cargo related tenants utilizing 4,500 SF of the warehouse space, but that space can be fully utilized for cargo purposes if the need should arise in the future.

Figure 28: Apron Space and Landside Space (IAD)

Aircraft Parking Area	Buildings 1 and 2	192,060 SF	Buildings 3 and 4	112,500 SF	Cargo Building 5	270,100 SF	Building 6	256,618 SF
Runway Length	R/W 1R - 19L	11500' x 150'	R/W 1C - 19C	11500' x 150'	R/W 1L-19R	9400' x 150'	R/W 12-30	10500' x 150'
Truck Parking	Dock	267	Landside	3874 LF	Truck Storage	158,617 SF		

Source: *Metropolitan Washington Airports Authority, 2020*

Intermodal Connectivity

Primary access to the interstate highway system in Virginia is provided via the Dulles Airport Access Road on I-495, south on VA 28 to I-66, and northwest on I-81 via I-66.

GROUND ACCESS

Ground access is broken down by roadway infrastructure and the number of routes, capacity, and frequency of the following transit services: Metrorail, Metrobus or other local bus, commuter bus, commuter rail, intercity bus, and intercity rail. For roadway access, see the intermodal connectivity outlined in the section above.

Metrorail

Metrorail's Phase II Silver Line Extension is expected to open in September 2020 with a 700-foot walk from the station via underground automated walkway to the Main Terminal. When complete, the Silver Line will provide service to IAD from points east and west into Loudoun County.

Figure 29: Metrobus/Fairfax Connector/Silver Line Express (IAD)

Routes	Metrobus 5A	Fairfax Connector 981/983	Silver Line Express
Capacity	50	50	43
Frequency	7 days hourly, 5:30 AM - 11:30 PM	7 days every 20 minutes, 9:15 AM - 6:55 PM; every 40 minutes 5:55 AM - 8:35 AM; 7:15 PM - 11:50 PM	7 days every 20 minutes; 7:00 AM - 10:30 PM

Source: *Metropolitan Washington Airports Authority, 2020*

Commuter Bus – Commuter bus service is not provided at IAD.
Commuter Rail – Commuter rail service is not provided at IAD.
Intercity Bus – Intercity bus is not provided at IAD.

CURBSIDE ACCESS

Curbside access is primarily defined by lane area and lane capacity, where lane area consists of the linear footage of lanes, and lane capacity involves the curbside capacity of lanes in terms of level of service (LOS) or the number of vehicles that the lanes can accommodate over the course of a year.

IAD is experiencing enplanement growth and as a result, the peak hour congestion has deteriorated, with delays of more than 10 minutes to reach the curbside. There is currently no long-term solution, but in the interim, the new designated pick-up area is helping minimize congestion by removing TNCs from the traffic mix. At IAD a significant limiting factor is that there is only one terminal set-up to do everything and is fixed as far as length goes.

There are 5,660 existing linear feet of curbside at IAD.

Figure 30: Lane Area (IAD)

Arrivals	5 lanes	1,300 linear feet
Departures	5 lanes	1,300 linear feet
Commercial Inner Curb	3 lanes	1,300 linear feet
Commercial Outer Curb	3 lanes	1,300 linear feet
Commercial TNC	3 lanes	460 linear feet
Total Curb: 5,660 linear feet		

Source: *Metropolitan Washington Airports Authority, 2020*

Figure 31: Curbside Access by Type (IAD)

Private Vehicles	1,300 linear feet
TNCs	430 linear feet
Taxicabs	600 linear feet
Airport Shuttle	500 linear feet
Dedicated Commercial	900 linear feet

Source: *Metropolitan Washington Airports Authority, 2020*

Rental Car Facility
Rental Car facilities are located north of the terminal area with customers transported via shuttles. The total square feet utilized by Rental Car Operations is 1,360,000 sf.

PARKING
Parking is defined by the number of parking spaces: 26,948.

Figure 32: Parking Spaces by Type (IAD)

Terminal (Hourly)	2,203
Garage (Daily)	8,312
Economy (Long-Term)	11,643
Employee	4,790
TOTAL	26,948

Source: *Metropolitan Washington Airports Authority, 2020*

Temporary Parking
In total, the cell phone lot and the TNC staging area have a total of 700 parking spaces.

GENERAL AVIATION FACILITIES
General aviation facilities consist of three elements: apron space, hangar space, and general aviation terminal and fixed-base operator (FBO) facilities. Apron space involves the square footage of the apron, hangar space consists of the total units of corporate/group and T hangars, and general aviation terminal and FBO facilities are measured in square footage.

Figure 33: Apron Space (IAD)

Taxiway F Remote Hardstands (R Gates)	1,408,088 square feet
Remote Deicing Pad	671,720 square feet

Source: *Metropolitan Washington Airports Authority, 2020*

These aprons are primarily used by air carriers for overnight parking but are used occasionally for General Aviation as well.

Hangars
Eight hangars make up 354,000 square feet, 35,000 square feet of which is used for office space. All other hangars are utilized for aircraft/airport support services.

General Aviation Terminal and FBO Facilities
Two fixed-based operators (FBO) serve general aviation at IAD, which have a total terminal and office space of 21,600 square feet and an FBO apron space of 154,600 square feet.

III. DEMAND ANALYSIS

The demand analysis was informed by an iterative series of in-person interviews and phone calls conducted by TPB staff with airport planning staff from each of the region's three major commercial airports – Baltimore/Washington International Thurgood Marshall Airport (BWI), Ronald Reagan Washington National Airport (DCA), and Washington Dulles International Airport (IAD). The following demand-based metrics were established to guide the demand analysis:

AIR SERVICE

Air service demand is measured by the total number of flights, enplanements by type (wide/narrow body aircraft and international/domestic airlines), and total number of gate turns (average number of gate turns multiplied by plane seating capacity).

CARGO

Air cargo demand consists of total annual cargo tonnage and factors influencing air cargo tonnage.

GROUND ACCESS

Ground access demand consists of ridership of the following modes: automobiles (broken down by sub-categories of private vehicle personal use, taxicabs, and transportation network companies), rental cars, Metrobus, commuter rail, intercity bus, and intercity rail.

CURBSIDE ACCESS

Curbside access demand is primarily defined by the frequency with which curbs reach the range of levels of service (LOS). LOS is a qualitative measure used to relate the quality of motor vehicle traffic *service*. *LOS* is used to analyze roadways and intersections by categorizing traffic flow and assigning quality *levels* of traffic based on performance measure like vehicle speed, density, and congestion. Typically, six levels of service are assigned a letter designation from A to F, with LOS A representing the best operating conditions, and LOS F the worst.

PARKING

Parking demand is defined by the number of people per car, annual ridership of the shuttle fleet, and/or the frequency of lot closures due to reaching capacity.

GENERAL AVIATION ACTIVITY

General aviation activity demand consists of annual operations statistics and the number of carriers and/or clients.

DEMAND ANALYSIS FOR BALTIMORE/WASHINGTON INTERNATIONAL THURGOOD MARSHALL AIRPORT (BWI)

AIR SERVICE

The total number of flights, enplanements by type (wide/narrow body aircraft and international/domestic airlines), and total number of gate turns (average number of gate turns multiplied by plane seating capacity).

Figure 34: Annual Number of Flights (BWI)

Type	2018	2045 Forecast
Domestic	114,232	194,981
International	2,325	3,967
Total	116,557	198,948

Source: *BWI Airport, 2020*

Figure 35: Annual Enplanements (BWI)

Aircraft Type	2018 Flights	2045 Forecast	TAF Growth Rate
Wide Body	78,254	119,944	1.594
Narrow Body	13,542,427	20,757,270	1.594
International	668,117	1,024,062	1.594
Domestic	12,952,564	19,853,153	1.594
TOTAL	**13,620,681**	**20,877,214**	

Source: *BWI Airport, 2020*

Gate Turns Multiplied by Average Seating Capacity

In 2018, the average number of turns per gate was 4.77 multiplied by an average seating capacity of 177 per aircraft, totaling 846 gate turns. Average seating capacity is estimated to be 191 by 2045. Assuming 4.77 turns per gate remains constant, the projected total is 912 gate turns by 2045.

CARGO

Air cargo consists of total annual cargo tonnage and factors influencing air cargo tonnage.

Air Cargo Tonnage

In 2018 air cargo totaled 214,156 short tons of freight and mail. The short ton is a mass measurement unit equal to 2,000 pounds. Assuming an approximate 1.3 percent growth rate, air cargo is projected to reach approximately 311,548 short tons by 2045.

Influences on Local Cargo Tonnage

Air cargo has increased by 80 percent over the last five years at BWI. E-commerce is creating a demand for intermodal air freight facilities and services in Maryland and at BWI Airport in particular. Amazon opened four fulfillment centers in Maryland and Under Armor is expected to open a large distribution center in Baltimore as well. The Governor's position that Maryland is "Open for Business"

is also contributing to encouraging economic and industry growth. BWI provides competitively convenient road access for air freight handlers.

GROUND ACCESS

Ground access consists of ridership of the following modes: automobiles (broken down by sub-categories of private vehicle personal use, taxicabs, and TNCs), rental cars, Metrobus, commuter rail, intercity bus, and intercity rail.

Figure 36: Annual automobile use total and modal percent share (BWI)

Private Car	**5,299,000**	63%
Rental Car	**1,193,000**	14%
TNC (Uber/Lyft)	**633,000**	8%
Taxi	**303,000**	4%

Source: *Washington-Baltimore Regional Air Passenger Survey, 2017*

Rental Car

962,773 total rentals in 2018. There is no forecasted growth, and conservative estimates are considering a 0.5-1 percent annual decrease.

Metrobus / Local Bus: B-30

Less than one percent, or less than 192,735, of air passengers traveled to BWI by bus in 2018. MTA does not officially produce ridership projections.

Commuter Bus: 201

While MTA does not produce official ridership projections, it is estimated that Bus 201's total ridership was 11,568 in FY 2018.

Commuter Rail: MARC Penn Line

MARC daily boarding at the BWI rail station exceeds 2,200 trips on weekdays, 500 on Saturdays and 300 on Sundays. Total MARC boarding at the BWI rail station in 2018 exceeded 600,000 trips. Three percent, or roughly 217,000 of total passengers traveled by commuter rail in 2018.

Intercity Bus: LocalLink 75 and Express BusLink 107

Average weekday ridership in 2019 for Route 75 was 1,238. The last record for Route 107 is from January 2018, with an average weekday ridership of 28.

Intercity Rail: Light Rail and Amtrak

In 2018 the average Light Rail weekday station boarding was 1,030 at BWI Airport and 212 at BWI Business Park, for a total ridership of 192,735. Amtrak MARC Station ridership for 2018 was 748,540.

CURBSIDE ACCESS

Curbside access is primarily defined by the frequency with which curbs reach the range of levels of service (LOS: A-F).

Levels of Service

Data is not available for the frequency with which curbs reach range of levels of service (A-F).

PARKING

Parking is defined by the number of people per car, annual ridership of the shuttle fleet, and/or the frequency of lot closures due to reaching capacity.

Vehicle Occupancy:

Data is not available for vehicle occupancy.

Shuttle Ridership

Annual shuttle fleet ridership was approximately six million in 2018. Assuming an approximate 1.6 percent growth rate, shuttle ridership is projected to reach approximately 9.2 million by 2045.

Figure 37: Frequency of Lot Closures (BWI)

	Number of Lot Closures 2018	Average Length of Time Closed (Hours: Minutes)	Lot Closure Rate			
			Lot Closures 2018 / 365 days		Lot Closures 2018 / 12 months	
Express Lot	244	7:50	0.668	per day	20.333	per month
Long-Term Parking	51	6:20	0.140	per day	4.250	per month
Daily Garage	5	9:06	0.014	per day	0.417	per month
Hourly Garage	1	6:55	0.003	per day	0.083	per month

Source: *BWI Airport, 2020*

GENERAL AVIATION ACTIVITY

General aviation activity consists of annual operations statistics and the number of carriers and/or clients.

Annual Operations

In 2018 general aviation operations totaled 10,022. Assuming an approximate 1.3 percent growth rate, this number is projected to reach approximately 14,195 by 2045.

Carriers

In 2018 there were 45 BWI-based tenants, while occasional, transient clients are not tracked.

DEMAND ANALYSIS FOR RONALD REAGAN WASHINGTON NATIONAL AIRPORT (DCA)

AIR SERVICE

The total number of flights, enplanements by type (wide/narrow body aircraft and international/domestic airlines), and total number of gate turns (average number of gate turns multiplied by plane seating capacity).

Figure 38: Annual Enplanements (DCA)

Aircraft Type	2018 Flights	2045 Forecast
International	183,576	273,357
Domestic	11,526,279	17,100,643
Total	11,709,855	11,373,000

Source: *Metropolitan Washington Airports Authority, 2020*

Gate Turns Multiplied by Average Seating Capacity

In 2018, the average number of turns per gate was 7.4 multiplied by an average seating capacity of 120 per aircraft, totaling 888 seats per gate per day.

CARGO

Air cargo consists of total annual cargo tonnage and factors influencing air cargo tonnage.

Air Cargo Tonnage

In 2018 air cargo totaled 2,336 short tons of freight and mail.

GROUND ACCESS

Ground access consists of ridership of the following modes: automobiles (broken down by sub-categories of private vehicle personal use, taxicabs, and transportation network companies), rental cars, Metrobus, commuter rail, intercity bus, and intercity rail.

Figure 39: Annual use total and percent share by mode (DCA)

Private Car	2,889,000	29%
TNC (Uber/Lyft)	2,057,000	21%
Taxicab	1,783,000	18%
Rental Car	853,000	9%
Metrorail	1,263,000	13%
Other	960,000	10%

Source: *Washington-Baltimore Regional Air Passenger Survey, 2017*

CURBSIDE ACCESS

Curbside access is primarily defined by the frequency with which curbs reach the range of levels of service (LOS: A-F).

Levels of Service
Data is not available for the frequency with which curbs reach range of levels of service (A-F).

PARKING
Parking is defined by the number of people per car, annual ridership of the shuttle fleet, and/or the frequency of lot closures due to reaching capacity.

Vehicle Occupancy
Data is not available for the number of vehicle occupancy.

Shuttle Ridership
Annual ridership of shuttle fleet is not available at the time of this report's creation.

Frequency of Lot Closures
Parking lots never reach capacity at DCA.

GENERAL AVIATION ACTIVITY
General aviation activity consists of annual operations statistics and the number of carriers and/or clients.

Annual Operations
In 2018 general aviation operations totaled 3,916. Assuming a 2 percent growth rate, by 2045 this number is projected to reach 6,684.

Carriers
Number of carriers/clients is not available at the time of this report's creation.

DEMAND ANALYSIS FOR WASHINGTON DULLES INTERNATIONAL AIRPORT (IAD)

AIR SERVICE

The total number of flights, enplanements by type (wide/narrow body aircraft and international/domestic airlines), and total number of gate turns (average number of gate turns multiplied by plane seating capacity).

Figure 40: Annual Enplanements (IAD)

Aircraft Type	2018 Flights	2045 Forecast
International	3,986,716	6,606,660
Domestic	7,956,547	13,185,340
Total	11,943,263	19,792,000

Source: *Metropolitan Washington Airports Authority, 2020*

Gate Turns Multiplied by Average Seating Capacity

In 2018, the average number of turns per gate was 3.1 multiplied by an average seating capacity of 120 per aircraft, totaling 372 seats per gate per day.

CARGO

Air cargo consists of total annual cargo tonnage and factors influencing air cargo tonnage.

Air Cargo Tonnage

In 2018 air cargo totaled 300,934 short tons of freight and mail.

GROUND ACCESS

Ground access consists of ridership of the following modes: automobiles (broken down by sub-categories of private vehicle personal use, taxicabs, and transportation network companies), rental cars, Metrobus, commuter rail, intercity bus, and intercity rail.

Figure 41: Annual use total and percent share by mode (IAD)

Private Car	3,420,000	52%
TNC (Uber/Lyft)	871,000	13%
Taxicab	759,000	11%
Rental Car	837,000	13%
Metrorail	0	0%
Other	718,000	11%

Source: *Washington-Baltimore Regional Air Passenger Survey, 2017*

CURBSIDE ACCESS

Curbside access is primarily defined by the frequency with which curbs reach the range of levels of service (LOS: A-F).

Levels of Service

Data is not available for the frequency with which curbs reach range of levels of service (A-F).

PARKING

Parking is defined by the number of people per car, annual ridership of the shuttle fleet, and/or the frequency of lot closures due to reaching capacity.

People Per Car

Data is not available for the number of people per car.

Shuttle Ridership

Annual ridership of shuttle fleet is not available at the time of this report's creation.

Frequency of Lot Closures:

Parking lots never reach capacity at IAD.

GENERAL AVIATION ACTIVITY

General aviation activity consists of annual operations statistics and the number of carriers and/or clients.

Annual Operations

In 2018 general aviation operations totaled 35,528 flights.

Carriers

Number of carriers/clients is not available at the time of this report's creation.

IV. PHASE 2 FINDINGS

The comprehensive Regional Air System Plan (RASP) Phase 2 Report concludes with a draft set of planning considerations that will be more fully developed in RASP Phase 3. Resulting directly from the supply and demand analyses conducted in RASP Phase 2, all three participating airports have identified the overarching need for future, more detailed and dynamic ground access studies for their respective facilities. Planning staff from each airport emphasized that the exercise of reporting key supply and demand-based metrics covering the range of their facility's operations has served incredibly helpful in reaching the conclusion that further studies will be crucial in improving their overall system performance.

DRAFT NEEDS ASSESSMENT METRICS

Air Service

- **Gate totals:** number of wide body gates and number of narrow body gates

Cargo

- **Warehouse space**: square footage of existing cargo warehouse space
- **Aircraft cargo capacity:** international wide-body flights and air cargo carrier capacity
- **Aircraft parking space:** for runway length, aircraft parking ramps, truck maneuvering
- **Intermodal connectivity:** access to the interstate highway system and cargo rail

Ground Access

- **Automobiles:** broken down by sub-categories of private vehicle personal use, taxicabs, and transportation network companies (TNCs, such as Uber and Lyft)
- **Rental car:** square footage of parking facility
- **Metro bus:** number of routes, capacity, frequency of service
- **Commuter rail:** number of routes, capacity, frequency of service
- **Intercity bus:** number of routes, capacity, frequency of service
- **Intercity rail:** number of routes, capacity, frequency of service

Curbside Access

- **Lane area:** linear footage of lanes
- **Lane capacity:** curbside capacity of lines, which represents the number of cars and/or passengers that the lanes can accommodate over the course of a year

Parking

- **Parking spaces:** number of parking spaces
- **Fleet size:** bus shuttle fleet size

General Aviation Activity

- **Ramp space:** area of ramp space for general aviation activity
- **Square footage:** total area of general aviation operations
- **Parking spaces:** number of parking spaces that support general aviation aircraft
- **Apron type**

DRAFT PLANNING CONSIDERATIONS

REVENUE

The region – and industry as a whole – is experiencing a major shift away from the traditional sources of revenue, including parking revenue, that the airport industry has relied on for the past several decades. As the region's ground access landscape continues to evolve, airports must continue thinking creatively and reacting nimbly to the changes underway. Given each airport's (proposed or actual) major future transportation infrastructure projects underway, there are potential revenue-generating opportunities for the increased posturing of BWI, DCA, and IAD as the gateways to the region.

GROUND ACCESS

Growing traffic congestion and surface transportation disruptors throughout the region continues to necessitate a greater amount of resources and strategic consideration be dedicated to each airport's individual ground access facilities, as well as the system-wide infrastructure that connects the region's air passengers and airport employees to the region's airports.

UNKNOWNS

From autonomous vehicles to major transportation investments like MAGLEV and the pedestrian bridge connecting Amazon HQ2 in Crystal City to DCA, a range of unknowns will have significant implications for how the region's airports continue to expand, contract, and differentiate their facilities and services.

CAPACITY

REGIONAL AIRPORT BALANCE

REGULATION

NEXTGEN

LAND USE COMPATIBILITY

UNMANNED AIRCRAFT SYSTEMS

PHASE 3

- **Planning Considerations:** An unconstrained set of planning considerations that relate to the region's entire air system, far beyond the ground access-focused scope of this particular RASP Update.
- **Needs Assessments:** Needs assessments for BWI, DCA, and IAD aligned with the supply and demand-based metrics outlined in Phase 2.
- **Ground Access Element Update:** Provides the ground access forecast update based on the 2017 Washington-Baltimore Regional Air Passenger Survey, as well as an exhaustive list of all proposed capital projects that are relevant to BWI, DCA, and/or IAD Airport connectivity within the long-range transportation plans of the Baltimore Metropolitan Council (BMC) and the National Capital Region Transportation Planning Board (TPB).
- **Recommendations:** Set of ground access transportation planning recommendations to the region's three major commercial airports, based on the findings from the entire RASP Phases 1-3 Report.
- **Next Steps:** Proposed timeline for future RASP Updates.

I. PLANNING CONSIDERATIONS

Each year, more than 35 million people and 400,000 tons of freight cargo pass through the region's three major airports. In all, BWI, DCA, and IAD Airports directly or indirectly support more than 450,000 jobs and some $50 billion in annual economic activity. While the overall RASP Update concludes with recommendations for the prioritization of projects, programs, and policies that specifically relate to improving airport ground access, given how interwoven many ground access-related issues are, RASP Phase 3 begins by highlighting an unconstrained set of planning considerations that are holistically important to the region's airports, and span far beyond the ground access-focused scope of this RASP Update. These planning considerations include the following long-term, regional factors: revenue, ground access, capacity, regional airport balance, land use compatibility, regulation, NextGen, COVID-19 recovery, cybersecurity, unmanned aircraft systems, and autonomous vehicles.

REVENUE

The airport industry as a whole - including the Washington-Baltimore Air System Region - is experiencing a significant shift in revenue streams due largely to growth of TNCs and the associated loss of parking and rental car fees. While parking revenue and rental car facility charges are decreasing, passenger facility charges, landing fees, and ground leases remain intact. Additionally, airports are mitigating the lost vehicle revenues by charging fees to TNCs.

As the region's ground access landscape continues to evolve, airports must continue thinking creatively and reacting nimbly to these changes. Given each airport's (proposed or actual) major future transportation infrastructure projects underway, there are potential revenue-generating opportunities for the increased posturing of BWI, DCA, and IAD as the gateways to the region.

GROUND ACCESS

Growing traffic congestion and surface transportation disruptors throughout the region continue to necessitate a greater amount of resources and strategic consideration be dedicated to each airport's individual ground access facilities, as well as the system-wide infrastructure that connects the region's air passengers and airport employees to the region's airports and facilitates the efficient movement of freight. As previously mentioned, the changing dynamics of ground transportation may evolve to new revenue streams as the demand for a front door drop-off and pick-up grow.

CAPACITY

In terms of capacity considerations, there are two factors to consider: (1) airfield capacity, which determines how many aircraft operations an airport can handle and (2) terminal capacity, meaning how many passengers each terminal and in total the entire airport can handle.

All three airports have sufficient capacity to accommodate demand for airfield operations.

Regarding terminal capacity, assuming pre-COVID-19 conditions, BWI's strategic plans and airport improvement plans account for foreseeable capacity growth based on increased business. DCA is at capacity with no new aircraft gates anticipated in the foreseeable future, and IAD has room to double capacity if needed. DCA plans to adjust aircraft to meet the demands of the markets they serve. However, if COVID-19 protocols remain necessary in the medium to long-term, more space will be needed everywhere, including in the terminals, to ensure safe airport operations for everyone.

REGIONAL AIRPORT BALANCE

The Washington-Baltimore region's airport balance is quite evenly split three ways in terms of enplanement volumes, but business is differentiated by trip purpose. While families and recreation-based travelers frequent BWI, business travelers prefer DCA, and international travelers prefer IAD.

In terms of the general aviation balance, IAD has the most significant general aviation service of the region's three major commercial airports. Reliever airports are facing challenges in the region. While reliever airports do not generate much ground transportation demand, they do serve a key economic function in facilitating executive level business transactions, especially with the decline in commercial air service during the COVID-19 outbreak.

LAND USE COMPATIBILITY

Although airports build and operate their facilities, it is important to note that the FAA controls the air traffic, which can have significant land use implications. FAA changes to air traffic control procedures can result in conflicts with the land use compatibility. Conversely, changes in land use in proximity to large airports, as a result of increasing development, necessitate that the airports increasingly coordinate with the counties and municipalities.

REGULATION

Regulation-wise, concerns of airport funding sustainability are placing increased pressure on substantially increasing the passenger facility charge (PFC), which has not kept up with the rate of inflation over the past decade. Increasing the PFC would require Federal legislation. Larger commercial airports with high passenger volumes support PFC increases while smaller airports are opposed. To date, PFC increased efforts have made it into FAA reauthorization bills, but thus far have never gone through. In the context of COVID-19, decreasing parking demand, and other factors causing declining airport revenues, there may be increased pressure to increase the PFC and provide the region's three major airports with a stronger revenue stream.

NEXTGEN

The Next Generation Air Transportation System, or NextGen, is the FAA-led modernization of America's air transportation system to make flying more safe, efficient, and predictable. NextGen is roughly halfway through a multi-year investment and implementation plan, which will conclude in 2025. To date, the FAA has implemented most of the foundational infrastructure to modernize the National Airspace System (NAS), including the Traffic Flow Management System, Time Based Flow Management, and En Route Automation Modernization. Starting in 2020, NextGen will shift from a focus on communications, navigation, and surveillance infrastructure to facilitating the transition from distance-based to time-based air traffic management. Modernizing the NAS will depend on partnerships with the aviation community. As such, the modernization efforts of BWI, DCA, and IAD will be well-served by maintaining and expanding their relationships with one another and the FAA. The region's three major commercial airports should work to identify solutions to the noise-based controversies that have resulted from NextGen. Such expressed concerns may financially impact airline, airport, and aviation manufacturing operations.

COVID-19 RECOVERY

While the full extent of COVID-19-related impacts to the aviation industry are still yet to be determined, at the time of this report's completion, the industry as a whole is anticipating an approximate three-year recovery period for air passenger activity to return to pre-COVID levels. Due to its predominantly personal/leisure travel demographic and low-cost airlines, BWI predicts that its

recovery will be swifter than those with larger international and business travel markets. As such, strategies should be identified to help these especially vulnerable markets alleviate the concerns of their target demographics and/or identify new potential customer bases.

Resulting from the global pandemic and its associated impact on the aviation industry, deployment of touchless technologies such as online check-in, electronic boarding passes and biometric verification of passenger identities will likely increase and become more common beyond the frequent flyer. Automation of the check-in process was already transitioning, and the recovery will likely accelerate the process.

CYBERSECURITY

From preventing cyberattacks to strengthening capacity for suddenly necessary technologies such as biometric scanning and temperature readings in the context of COVID-19, the region's airports must be equipped with the tools necessary to operate safely, reliably, and efficiently in an increasingly cyber-dependent world. An ongoing cybersecurity information exchange between BWI, DCA, and IAD could be beneficial to share best practices as well as concerns and opportunities.

UNMANNED AIRCRAFT SYSTEMS

Growth in the unmanned aircraft systems (UAS) market may have the potential to affect airport operations. The nature of these impacts is unclear and could entail both beneficial and adverse impacts. UAS growth could result in decreased demand for conventional air passenger and/or air cargo services, which in turn can affect revenue. Airports can also view growth in UAS as an opportunity to identify how airport facilities can be leveraged to enable airports to have a notable role in the growing UAS market.

AUTONOMOUS VEHICLES

The eventual implementation and proliferation of autonomous vehicles is prompting airports everywhere, including in the Washington-Baltimore region, to determine what infrastructure will be necessary to accommodate this growing technology while remaining competitive.

II. NEEDS ASSESSMENT

Informed by the RASP Phase 2 Supply and Demand Analysis, the RASP Phase 3 Needs Assessment identifies air service, cargo, ground access, curbside access, parking, and general aviation-based needs for BWI, DCA, and IAD airports. In turn, the Needs Assessment informs the Air System-Wide Recommendations outlined in Section III of RASP Phase 3.

BALTIMORE/WASHINGTON INTERNATIONAL THURGOOD MARSHALL AIRPORT (BWI)

AIR SERVICE

TERMINAL DEVELOPMENT ELEMENTS

Near term terminal development projects include a relocated Airport Traffic Control Tower (ATCT), post-security concourse connectors, concourse extensions to provide additional gates, as well as baggage claim and security checkpoint expansion projects. Renovations of aging terminal facilities will also take place on an as-needed basis.

Adding new and expanded baggage facilities are necessary to accommodate maximum utilization of the existing gates at BWI and improve efficiency and predictability of baggage operations. Concourse extensions and post-security connectors will provide additional gates, as well as allow for new concessions and airline support space. A new, relocated ATCT will provide the necessary line of sight to all areas of the expanded airfield and maximize development space within the terminal area.

The principal longer term project for the BWI terminal includes construction of a new Concourse F to meet growing traveler demand for expanded service and additional destinations. Concourse F will provide ticket counter space, baggage facilities, and new gates for both new carriers and the growth of existing carriers.

AIRFIELD IMPROVEMENTS

To meet airfield capacity demands and prevent significant delays to airfield operations, the addition of a new parallel runway, as well as extension of an existing runway is included in the long-range planning vision for BWI. Other needed airfield projects include taxiway/taxi-lane improvements as well as additional remain overnight (RON) parking and deicing areas to improve efficiency and accommodate projected airline activity demands.

CARGO OPERATIONS

To accommodate projected growth and improve overall efficiency, BWI plans to expand and relocate various air cargo facilities. To free up valuable airfield real estate and provide room for the proposed Concourse F, various cargo buildings, airport support facilities, and maintenance buildings currently located along the northern portion of the airport campus will be relocated. These relocations will allow like functions to be collocated and maximize land use within the airport campus.

GROUND ACCESS & LANDSIDE SUPPORT FACILITIES

As ground transportation options continue to emerge and change, BWI plans to develop a multimodal Ground Transportation Center (GTC) and additional parking facilities centrally located in the terminal core.

In the future, development of an Automated People Mover (APM) system is anticipated to provide passengers with a reliable and convenient form of transportation between the terminal, GTC, public parking lots, and the BWI Amtrak station.

Additionally, reconfiguration of roadways leading to and around the airport is proposed to provide safe, efficient access within the community and to accommodate planned airfield growth.

CURBSIDE ACCESS

Along with the reconfiguration of roadways leading to the airport, both an expanded curbside as well as the GTC are proposed to ease congestion along the terminal loading zones. The multimodal GTC plans to conveniently centralize commercial, transit and ride share operators away from the terminal curb-front and provide traveler amenities such as remote bag drop and check-in. This in turn will improve traffic flow along the curb-front for those travelers using private automobiles or the BWI parking shuttles.

PARKING

Demand for parking at BWI will fluctuate as alternative modes of transportation emerge and change. While the GTC will influence this as well, BWI still plans for structured public parking within the terminal core. Various parking lots on airport property, accessible by shuttle fleet, will continue to provide convenient access for travelling passengers that wish to arrive by private automobile and park their vehicle.

GENERAL AVIATION

Corporate and business aviation within the Baltimore region remains strong and is expected to increase over the next several years. As demand may warrant, expansion of the BWI general aviation facilities (apron and hangars) can be accommodated immediately adjacent the existing fixed base operator in the northeast quadrant of the airport. Additionally, Martin State Airport, also owned by Maryland Aviation Administration, remains a critical general aviation reliever to BWI. With its 7,000-foot runway and precision instrument approach, Martin State has the capability of serving executive and international aircraft and has plans to expand its facilities and amenities accordingly.

RONALD REAGAN WASHINGTON NATIONAL AIRPORT (DCA)

AIR SERVICE

TERMINAL DEVELOPMENT ELEMENTS

The program known as Project Journey is expected to be complete in the spring of 2021. Project Journey consists of the replacement of remote hardstand gates with contact gates and two new security check points. No additional gates are anticipated in the near term. However, planning work has begun on an in-line baggage screening facility with the expectation that it could be in place by the mid-2020's. Long term terminal development projects will look at more efficient configurations of Terminal A that maintain the same number of gates as today.

AIRFIELD IMPROVEMENTS

Improvements on the airfield will largely consist of taxiway geometry changes that eliminate so called "hotspots" where the risk of a collision is highest. These improvements include reconfiguring hold aprons at both ends of the main runway. Additionally, parallel taxiways will be realigned resulting in removal of some wide expanses of paved areas that can become confusing to taxiing aircraft. Rehabilitation of deteriorated pavement will be ongoing throughout the airfield and includes rehabilitation of the main runway in the next three years.

CARGO OPERATIONS

Cargo operations are not expected to show much growth at DCA, and in general, cargo is not a significant operation at DCA. In the long term, a consolidated distribution center for all airside deliveries is anticipated.

GROUND ACCESS & LANDSIDE SUPPORT FACILITIES

Ground transportation modes continue to be very dynamic. A comprehensive study resulted in an update to the Airport Layout Plan showing expanded public parking, expanded rental car operations area, and a reconfigured roadway system that streamlines traffic flows resulting in expanded capacity. As Amazon's headquarters grows in adjacent Crystal City, local planners are evaluating a pedestrian bridge connection directly to the airport. This may encourage more walking to the airport but would not likely become a significant percentage of overall passengers.

CURBSIDE ACCESS

Due to the high dynamics of modal choice, curbside allocation will likely remain an ongoing exercise. However, once the ongoing construction program is complete and all existing curb area is restored to service, the expectation is the curbside will provide an acceptable level of service in the near term. When public parking is expanded in accordance with the airport layout plan, additional secondary curbs farther from the terminal are expected. These curbs may serve lesser used modes or provide passengers with lower cost options for drop-off and pick-up.

PARKING

Demand for parking is still expected to grow but not at the same rate as it once did before the popularity of TNCs. An additional 1,800 public parking spaces are still anticipated over the long term and will be located adjacent to the existing structured parking. The remote economy lot product will shrink over time to make room for displaced facilities for the new structures, but overall inventory of public parking will grow.

GENERAL AVIATION

Due to the continued restrictions on general aviation for operations at DCA, very little growth is anticipated in general aviation in the near term. Should restrictions change, growth may increase but space will be limited due to the constrained land available for expansion.

WASHINGTON DULLES INTERNATIONAL AIRPORT (IAD)

AIR SERVICE

TERMINAL DEVELOPMENT ELEMENTS

The most recent IAD master plan envisions the construction of two new concourses and a terminal to the South that mirrors the Main Terminal and nearly doubles the gate capacity of what is in place today. In the near term, three additional gates serving narrow body aircraft are anticipated as well as one additional wide body aircraft gate and will follow the expansion plans as envisioned. However, over the next few years, MWAA will be re-evaluating the master plan with an eye towards making Terminals more walkable and in step with many recently constructed airports around the world.

AIRFIELD IMPROVEMENTS

In order to continue to meet airfield capacity demands, the addition of a new parallel crosswind runway is anticipated. However, the need for this runway is envisioned in the long term. Additional cross-field taxiways are anticipated in the medium term to enhance the operations of a runway that went into operation in 2008. Other taxiway connections promoting circulation on and off runways will also be added. In the near term, one of the runways will be reconstructed and widened to accept aircraft with wingspans exceeding 215 feet.

CARGO OPERATIONS

The current master plan provides areas on the airfield for growth of cargo. The re-evaluation of the master plan will consider other areas that can provide space not only for airside cargo operations but space for related freight forwarders and others.

GROUND ACCESS & LANDSIDE SUPPORT FACILITIES

Phase 2 of the Silver Line of the Metrorail, which will include service to IAD, is expected to go into operation in the Spring of 2021 and will offer another modal choice for passengers. Other ground transportation modes such as TNCs are growing and are now one of the top three modal choices. The re-evaluation of the master plan will consider these changes.

CURBSIDE ACCESS

A new curb was recently completed at Dulles, providing an additional 500 feet of curb that will be dedicated to TNCs. Curbside operations at IAD and DCA are similar. Curbside space allocation will continue to be evaluated. Remote curbs in parking garages will also be evaluated where convenient walking paths for passengers are already provided. The master plan re-evaluation will consider a Ground Transportation Center (GTC) where most modes choices can be accessed.

PARKING

As similarly anticipated at DCA, demand for parking at IAD is still expected to grow but not at the same rate that it once did. An assessment of public parking revealed that no additional public parking would be needed over the next 20 years based on current demand. As referenced above, the re-evaluation of the master plan will consider opportunities to enhance public parking convenience as well as other modes.

GENERAL AVIATION

General aviation activity has been growing steadily over the past decade at IAD in part due to the restrictions at DCA. A new general aviation facility went into operation in the early 2000's and the airport has allocated additional land for future growth that is expected to meet future demand.

III. GROUND ACCESS ELEMENT UPDATE

The Ground Access Element Update portion of the RASP is twofold: (1) it shares the most recent ground access forecast update conducted based off of the 2017 Washington-Baltimore Regional Air Passenger Survey and (2) it identifies plans, policies, and programs of critically important roadway and transit improvements that are relevant to BWI, DCA, and/or IAD Airport connectivity, as outlined in Visualize 2045 and Maximize2045, the federally mandated, long-range transportation plans for the National Capital Region Transportation Planning Board (TPB) and the Baltimore Metropolitan Council (BMC), respectively.

GROUND ACCESS FORECAST UPDATE

In FY19, as part of the Air Passenger Origin/Destination and Air Passenger Ground Access Forecast Update projects, COG staff reviewed the air passenger trips input to the regional travel demand modeling process. This exercise consisted of the following major tasks: review and update FAA Terminal Area Forecast inputs, review the results of the 2017 Washington-Baltimore Regional Air Passenger Survey, and review and update the MWCOG and BMC planning areas land use forecasts included in the Round 9.1 Cooperative Forecasts. The product of these tasks is an update of base year and forecast year annual and weekday air passenger ground access trips by mode and time-of-day for the MWCOG travel demand modeling region.

The technical details of the forecasts themselves are well documented in the aforementioned ground access forecast update reports and in the table below. The intent of this section is simply to demonstrate that demand for airports will continue to grow and therefore it is necessary to plan for that growth. This growth cannot be accommodated without the projects identified in the Recommendations section in this report. Without those improvements, existing bottlenecks will worsen, continuing to negatively impact travel to the airports, and accessibility will decrease in future years. The planned regional transportation network contained in Visualize 2045 and Maximize2045 can effectively serve the needs of the region's air passengers, but only if advanced and constructed according to project schedules.

Air Passenger Ground Access Trips by Mode of Access

Air passenger trips to the airports consist of a larger mode choice set compared with what is ordinarily used in COG's standard mode choice modeling procedures. The ground access trips to the airports were summarized into four major arrival modes as follows:

Auto = Private Car, Rental Car, Transportation Network Companies (TNCs) and Taxi
Transit = Metrorail, Amtrak/MARC/VRE and Light Rail
Airport Transit = Airport Bus/Limo and Hotel/Motel Courtesy Shuttle
Other = Charter Bus, Employer Shuttle, and All Other

The auto mode of arrival was further split into two sub-categories:
Auto Driver
Auto Passenger

The split of auto ground access trips into auto driver and auto passenger trips was determined from the air passenger survey question that asked for the total number of household members, friends, or business associates that traveled with the surveyed air passenger to the airport (Question B-5). From this question the total vehicle occupancy of air passengers arriving at the airport by private or rental cars could be determined. The reciprocal of this number yields the proportion of air passengers who were likely auto drivers. The complement of this reciprocal yields the proportion of air passengers who were likely auto passengers. Multiplying the survey record weights by these proportions produces estimates of the number of air passenger who were auto drivers and the number of air passengers who were auto passengers for these auto ground access trips. Air passengers arriving at the airport by taxi are, by definition, auto passengers.

Once the ground access mode of arrival trip data had been summarized, modal shares for Auto Driver, Auto Passenger, Transit, Airport Transit and Other arrival modes were calculated for each

Airport/AAZ/trip origin type/resident status classification. Table 1 shows estimated 2017 to 2045 air passenger ground access trip totals by mode of arrival.

Table 1: Average Weekday Air Passenger Ground Access Trips 2045 Forecast (All Airports)

Arrival Mode - BWI

Forecast Year	Auto Driver	Auto Passenger	Transit	Airport Transit	Other	Total
2017	5,975	8,047	910	1,079	211	16,222
2020	6,473	8,706	1,010	1,159	229	17,577
2025	7,107	9,562	1,142	1,274	256	19,341
2030	7,809	10,500	1,271	1,398	281	21,259
2035	8,520	11,467	1,401	1,555	307	23,250
2040	9,276	12,483	1,541	1,738	340	25,378
2045	10,421	14,029	1,751	1,964	379	28,544

Arrival Mode - DCA

Forecast Year	Auto Driver	Auto Passenger	Transit	Airport Transit	Other	Total
2017	9,614	12,267	4,201	1,737	634	28,453
2020	10,189	12,987	4,385	1,819	662	30,042
2025	11,409	14,529	4,892	2,046	729	33,605
2030	11,840	15,100	5,082	2,198	759	34,979
2035	12,167	15,512	5,214	2,265	785	35,943
2040	12,468	15,872	5,325	2,341	807	36,813
2045	12,743	16,224	5,407	2,443	819	37,636

Arrival Mode - IAD

Forecast Year	Auto Driver	Auto Passenger	Transit	Airport Transit	Other	Total
2017	7,457	9,674	402	1,072	395	19,000
2020	7,790	10,118	426	1,113	404	19,851
2025	8,685	11,275	473	1,261	444	22,138
2030	9,633	12,493	531	1,409	498	24,564
2035	10,611	13,759	593	1,558	543	27,064
2040	11,656	15,086	653	1,707	589	29,691
2045	12,721	16,475	722	1,883	642	32,443

Arrival Mode - ALL

Forecast Year	Auto Driver	Auto Passenger	Transit	Airport Transit	Other	Total
2017	23,046	29,988	5,513	3,888	1,240	63,675
2020	24,452	31,811	5,821	4,091	1,295	67,470
2025	27,201	35,366	6,507	4,581	1,429	75,084
2030	29,282	38,093	6,884	5,005	1,538	80,802
2035	31,298	40,738	7,208	5,378	1,635	86,257
2040	33,400	43,441	7,519	5,786	1,736	91,882
2045	35,885	46,728	7,880	6,290	1,840	98,623

Source:- 2017 Washington-Baltimore Regional Air Passenger Survey

Note :- Totals may not add due to rounding

VISUALIZE 2045, NATIONAL CAPITAL REGION TRANSPORTATION PLANNING BOARD (TPB)

Visualize 2045 is the federally mandated, long-range transportation plan for the National Capital Region. It represents a new kind of long-range planning effort in this region. For the first time, in addition to projects that the region's transportation agencies expect to be able to afford between now and 2045, the plan includes aspirational projects, programs, and policies that go beyond financial constraints.

The following section highlights the projects, programs, and policies in Visualize 2045 that support ground access to BWI, DCA, and IAD.

Aspirational Initiatives
The express travel network would provide several benefits for airport ground access connectivity, including reducing congestion and incentivizing travelers to either carpool or travel by transit vehicle. Expanding Metrorail capacity would increase logistical ease and comfort for those traveling by Metrorail to and from airports.

Planning Factors
- Enhance travel and tourism.
- Increase accessibility and mobility of people.
- Increase accessibility and mobility of freight.

Regional Transportation Priorities Plan (RTPP) Goals
- Provide a comprehensive range of transportation options.
- Support inter-regional and international travel and commerce.

Table 2: Visualize 2045 MDOT Interstate Roadway Airport Ground Access Projects

						Facility		Lanes		
Agency / County	Corridor Type	Improvement	Facility	From	To	Fr	To	Fr	To	Completion Date
MDOT										
Interstate										
MDOT	Interstate	Construct	I 270 Interchange	at Watkins Mill Road		1	1	8	8	2020
MDOT	Interstate	Construct/Widen	I 270 Toll Lanes	I 495	I 270Y	1	1	4 + 2 HOV	4 + 2 HOV + 4 ETL	2025
MDOT	Interstate	Construct/Widen	I 270 Toll Lanes	I 270Y	I 370	1	1	10 + 2 HOV	10 + 2 HOV + 4 ETL	2025
MDOT	Interstate	Construct/Widen	I 270 Northbound Toll Lanes	I 370	Middlebrook Road	1	1	3 + 1 HOV NB	3 + 1 HOV + 2 ETL NB	2025
MDOT	Interstate	Construct/Widen	I 270 Southbound Toll Lanes	Middlebrook Road	I-370	1	1	4 SB	4 + 2 ETL SB	2025
MDOT	Interstate	Construct/Widen	I 270 Northbound Toll Lanes	Middlebrook Road	MD 121	1	1	2 + 1 HOV NB	2 + 1 HOV NB +2 ETL	2025
MDOT	Interstate	Construct/Widen	I 270 Southbound Toll Lanes	MD 121	Middlebrook Road	1	1	3 SB	3 + 2 ETL SB	2025
MDOT	Interstate	Construct/Widen	I 270 Toll Lanes	MD 121	I 70 / US 40	1	1	4	4+4 ETL	2025
MDOT	Interstate	Construct	I270 southbound auxiliary lane	South of Shady Grove Rd local slip ramp	South of Shady Grove Rd express lanes slip	1	1			~~2019~~ 2020
MDOT	Interstate	Construct	"	Md 28 on-ramp	MD 189 off-ramp	1	1			2019
MDOT	Interstate	Construct	I270 southbound (innovative congestion	MD 189 on-ramp	Montrose Road off-ramp	1	1			2019
MDOT	Interstate	Construct	"	North of Montrose Road	Democracy Boulevard	1	1			2019
MDOT	Interstate	Construct	I270 northbound (innovative congestion management)	Democracy Boulevard on-ramp	North of Montrose Road slip ramp to local lanes	1	1			2019
MDOT	Interstate	Construct	"	Shady Grove Road	I-370 off-ramp	1	1			2019

Source: Visualize 2045, National Capital Area Transportation Planning Board, 2020

Table 2 Continued

						Facility		Lanes		
Agency / County	Corridor Type	Improvement	Facility	From	To	Fr	To	Fr	To	Complete Date
MDOT										
Interstate										
MDOT	Interstate	Construct	"	MD 121	Comus Road Bridge	1	1			2019
MDOT	Interstate	Construct	I270 northbound auxiliary lane (innovative congestion management)	MD 189 on-ramp	MD 28 off-ramp	1	1			2019
MDOT	Interstate	Construct	"	South of MD 28 slip ramp to express lanes	North of MD 28 slip ramp to local lanes	1	1			2019
MDOT	Interstate	Construct	"	MD 124 on-ramp	Watkins Mill Road off-ramp	1	1			2019
MDOT	Interstate	Construct	"	Watkins Mill Road on-ramp	Middlebrook Road westbound off-ramp	1	1			2019
MDOT	Interstate	Construct/Widen	I 495 Toll Lanes	Virginia State line/Potomac River (including American Legion Bridge)	I 270Y	1	1	8/10	8/10+4 ETL	2025
MDOT	Interstate	Construct/Widen	I 495 Toll Lanes	I 270Y	MD 355	1	1	6	6+4 ETL	2025
MDOT	Interstate	Construct/Widen	I 495 Toll Lanes	MD 355	I 95	1	1	8	8+4 ETL	2025
MDOT	Interstate	Construct/Widen	I 95 / I 495 Toll Lanes	I 95	Baltimore Washington Parkway	1	1	8	8+4 ETL	2025
MDOT	Interstate	Construct/Widen	I 95 / I 495 Toll Lanes	Baltimore Washington Parkway	Glenarden Parkway	1	1	8	8+4 ETL	2025
MDOT	Interstate	Construct/Widen	I 95 / I 495 Toll Lanes	Glenarden Parkway	MD 202F	1	1	10	10+4 ETL	2025
MDOT	Interstate	Construct/Widen	I 95 / I 495 Toll Lanes	MD 202F	Potomac River (not including Wilson Bridge)	1	1	8	8+4 ETL	2025

Source: Visualize 2045, National Capital Area Transportation Planning Board, 2020

Table 3: Visualize 2045 MDOT Primary Roadway Airport Ground Access Projects

						Facility		Lanes		
Agency / County	Corridor Type	Improvement	Facility	From	To	Fr	To	Fr	To	Complete Date
MDOT										
Primary										
MDOT	Primary	Widen	MD 3 Robert Crain Highway	I595/US 50/US 301	Anne Arundel County Line	2	2	4	6	2035
Anne Arundel Co.	Primary	Widen	US 50	I-97	MD 2	1	1	6	8	2045
Anne Arundel Co.	Primary	Widen	I-295	I-195	MD 100	1	1	4	6	~~2030~~ 2035
Anne Arundel Co.	Primary	Widen	MD 2	US 50	I-695			4	6	2035
Anne Arundel Co.	Primary	Widen	MD 3	MD 32	St. Stephen's Church Rd.	2	2	4	6	2025
Anne Arundel Co.	Primary	Widen	MD 100	Howard Co. Line	I-97		5/1	4	6	2035
Anne Arundel Co.	Primary	Widen	MD 175	MD 170	~~BW Parkway~~ National Business Parkway		2	4	6	2025
Anne Arundel Co.	Primary	Widen	MD 198	MD 32	BW Parkway	2	2	2	4	2030
Anne Arundel Co.	Primary	Widen	MD 713	MD 175	~~Arundel Mills Boulevard~~ Stoney Run Dr.		2	2	4	2040

Source: Visualize 2045, National Capital Area Transportation Planning Board, 2020

Table 4: Visualize 2045 Howard County Primary Roadway Airport Ground Access Projects

						Facility		Lanes		
Agency / County	Corridor Type	Improvement	Facility	From	To	Fr	To	Fr	To	Complete Date
Howard County										
Primary										
Howard Co.	Primary	Widen	I-70	US 29	~~US 40~~ MD 32	1	1	4	6	~~2025~~ 2035
Howard Co.	Primary	Widen	I-95 Peak period shoulder use	MD 32	MD 100	1	1	4	4+1	2035
Howard Co.	Primary	Widen	US 29 NB	Middle Patuxent River	Seneca Dr.		5	4	6	2030
Howard Co.	Primary	Widen	US 29 NB	Seneca Dr.	MD 100	5	5	5	6	2017
Howard Co.	Primary	Widen	MD 32	MD 108	I-70		2	2	4	2021
Howard Co.	Primary	Widen	MD 32	I-70	Howard/ Carroll County Line River Rd			2	4	2045
Howard Co.	Primary	Widen	MD 100	I-95	AA/Howard Line	1	1	4	6	2035

Source: Visualize 2045, National Capital Area Transportation Planning Board, 2020

Table 5: Visualize 2045 VDOT Interstate Roadway Airport Ground Access Projects

						Facility		Lanes		
Agency / County	Corridor Type	Improvement	Facility	From	To	Fr	To	Fr	To	Complete Date
VDOT										
Interstate										
VDOT	Interstate	Construct	I 66 Vienna Metro Station bus ramp (duplicate project with ConID 759,	Transit Ramps- from EB & to WB	Saintsbury Dr.	1	1	0	2	2021
VDOT	Interstate	Reconstruct	I 66 WB Operational/Spot Improvements	Westmoreland Dr. / Washington Blvd Exit	Haycock Rd /Dulles Access Highway	1	1	3	4	2020
VDOT	Interstate	Reconstruct	"	Lee Highway/Spout Run On-Ramp	Glebe Road Off-Ramp	1	1	2	3	2020
VDOT	Interstate	Widen / Revise Operations	I-66	I-495	US 50	1	1	3 general purpose in each direction + 1 HOV in peak direction during peak period	3 general purpose + 1 Auxiliary + 2 HOT each direction	2021
VDOT	Interstate	Widen / Revise Operations	I-66	US 50	US 29 Centreville	1	1	4 general purpose in each direction off-peak, 3 general purpose + 1 HOV in peak direction during peak period	3 general purpose + 1 Auxiliary + 2 HOT in each direction (2 Aux per direction btwn VA 286 & VA 28 only)	2021
VDOT	Interstate	Widen / Revise Operations	I-66	US 29 Centreville	University Boulevard Ramps (new interchange for HOT only)	1	1	4 general purpose in each direction off-peak, 3 general purpose + 1 HOV in peak direction during peak period	3 general purpose + 2 HOT in each direction	2021
VDOT	Interstate	Widen / Revise Operations	I-66	VA 234 Bypass	University Blvd.	1	1	4 general purpose in each direction off-peak, 3 general purpose + 1 HOV in peak direction during peak period	3 general purpose+ 2 HOT in each direction (+1 Auxiliary each direction between US 29 and VA 234 Bypass only)	2021
VDOT	Interstate	Widen / Revise Operations	I-66	University Boulevard Ramps (new interchange for HOT only)	US 15 (1.2 miles west of)	1	1	4 general purpose in each direction off-peak, 3 general purpose + 1 HOV in peak direction during peak period	3 general purpose+ 2 HOT in each direction (+1 Auxiliary each direction between US 29 and VA 234 Bypass only)	2040
VDOT	Interstate	Revise Operations	I-66	I-495	US 29 near Rosslyn	1	1	HOV 2 in peak direction during peak period	HOT 2 in peak direction during peak period	2017
VDOT	Interstate	Revise Operations	I-66	I-495	US 29 near Rosslyn	1	1	HOT 2 in peak direction during peak period	HOT 3 in peak direction during peak period	2021

Source: Visualize 2045, National Capital Area Transportation Planning Board, 2020

Table 5 Continued

						Facility		Lanes		
Agency / County	Corridor Type	Improvement	Facility	From	To	Fr	To	Fr	To	Complete Date
VDOT										
Interstate										
VDOT	Interstate	Revise Operations	I-66	I-495	US 29 near Rosslyn	1	1	HOT 3 in peak direction during peak period	HOT 3 in both directions during peak period	2040
VDOT	Interstate	Construct/Widen	I 66 Eastbound	VA 267 DTR	Washington Blvd. Off-Ramp	1	1	3	4	2020
VDOT	Interstate	Construct/Widen	I 66 Eastbound	Washington Blvd. Off-Ramp	North Fairfax Drive	1	1	2	3	2020
VDOT	Interstate	Construct/Widen	I 66 Westbound	Sycamore Street	Washington Blvd. On-Ramp	1	1	2	3	2040
VDOT	Interstate	Construct	I-66 Express Lanes Interchange Ramps	EB Expr to SB GP; NB GP to WB Expr; SB Expr to WB Expr; EB Expr to NB GP; SB GP to WB Expr	I-495 Interchange (Capital Beltway GP and Express Lanes)	0	1	0	1	2022
VDOT	Interstate	Construct	I-66 General Purpose Lanes Interchange Ramp	NB Expr to WB GP (modification of existing loop ramp)	I-495 Interchange (Capital Beltway GP and Express Lanes)	0	1	0	1	2022
VDOT	Interstate	Relocate / Reconstruct	I-66 Interchange	Dual-lane loop ramp from NB I-495 GP to I-66 GP relocated to dual-lane flyover & existing ramp modified to NB I-495 GP to I-66 WB HOT	@ I-495	1	1	2	2	2022
VDOT	Interstate	Reconstruct	I-66 Interchange	EB GP to SB GP; WB GP to SB GP; WB GP to SB Expr; NB GP to EB GP; SB GP to WB GP	@ I-495	1	1	–	–	2022
VDOT	Interstate	Construct	I-66 flyover ramp	EB general purpose to EB express lanes	.5 mile east of VA 243	0	1	0	1	2022
VDOT	Interstate	Reconstruct	I-66 Interchange	Cloverleaf interchange converted to diverging diamond interchange	@ Nutley Street (VA 243)	1	1	–	–	2022
VDOT	Interstate	Construct	I-66 Express Lanes Interchange Ramps (duplicate project with ConID 399, above)	EB off-ramp, WB on-ramp to/from I-66 Express lanes BUS /HOV-3/HOT ONLY	@ Vaden Drive / Vienna Metro Station	1	1		Bus / HOV-3 / HOT from proposed Express Lanes	2022

Source: Visualize 2045, National Capital Area Transportation Planning Board, 2020

Table 5 Continued

						Facility		Lanes		
Agency / County	Corridor Type	Improvement	Facility	From	To	Fr	To	Fr	To	Complete Date
VDOT										
Interstate										
VDOT	Interstate	Widen	I 495 Capital Beltway NB Auxiliary Lane	North of Hemming Ave. Underpass	Braddock Road Off Ramp	1	1	4+2	5+2	2030
VDOT	Interstate	Widen	I 495 Capital Beltway SB Auxiliary Lane	Braddock Road On Ramp	North of Hemming Ave. Underpass	1	1	4+2	5+2	2030
VDOT	Interstate	Widen	I 495 Capital Beltway NB Auxiliary Lane	Braddock Road On Ramp	VA 236 Off Ramp	1	1	4+2	5+2	2030
VDOT	Interstate	Widen	I 495 Capital Beltway NB Auxiliary Lane	VA 236 On Ramp	Gallows Road Off Ramp	1	1	4+2	5+2	2030
VDOT	Interstate	Widen	I 495 Capital Beltway SB Auxiliary Lane	Gallows Road On Ramp	VA 236 Off Ramp	1	1	4+2	5+2	2030
VDOT	Interstate	Widen	I 495 Capital Beltway NB Auxiliary Lane	US 50 On Ramp	I 66 Off Ramp	1	1	5+2	6+2	2030
VDOT	Interstate	Widen	I 495 Capital Beltway SB Auxiliary Lane	VA 7 On Ramp	I 66 Off Ramp to WB	1	1	4+2	5+2	2030
VDOT	Interstate	Widen	I 495 Capital Beltway SB Auxiliary Lane	VA 123 On Ramp	VA 7 Off Ramp	1	1	5+2	6+2	2030
VDOT	Interstate	Widen	I 495 Capital Beltway NB Auxiliary Lane	VA 267 On Ramp	VA 193 Off Ramp	1	1	4+2	5+2	2030

Source: Visualize 2045, National Capital Area Transportation Planning Board, 2020

Table 6: Visualize 2045 VDOT Primary Roadway Airport Ground Access Projects

						Facility		Lanes		
Agency / County	Corridor Type	Improvement	Facility	From	To	Fr	To	Fr	To	Complete Date
VDOT										
Primary										
VDOT	Primary	Widen	VA 7 Leesburg Pike	VA 123 Chain Bridge Road	I 495 Capital Beltway	2	2	6	8	~~2021~~ 2030
VDOT	Primary	Widen	VA 7 Leesburg Pike	I 495	I 66	2	2	4	6	~~2021~~ 2030
VDOT	Primary	Widen	VA 7	Seven Corners	Bailey's Crossroads	2	2	4	6	~~2025~~ 2030
VDOT	Primary	Widen	US 15 James Madison Highway	US 29 Lee Highway	Haymarket Drive	3	3	2	4	2040
VDOT	Primary	Widen	US 15 James Madison Highway Overpass	1200' S of RR tracks	1000' N. of RR tracks	3	3	2	4	2030
VDOT	Primary	Widen	VA 28 PPTA Phase II	I 66	Westfields Blvd	5	5	6	8+ 2 aux	2021
VDOT	Primary	Widen	VA 28 PPTA Phase II	Westfields	US 50	5	5	6	8	2025
VDOT	Primary	Widen	VA 28 PPTA Phase II	US 50	Sterling Blvd.	5	5	6	8	2016
VDOT	Primary	Widen	VA 28 PPTA Phase II	Sterling Blvd.	VA 7	5	5	6	8	2025
VDOT	Primary	Study	VA 28 Manassas Bypass /VA 411	VA 234 Sudley Road	I 66 Proposed Interchange					Not Coded
VDOT	Primary	Widen	VA 28 Centreville Road	~~VA 898 Old Cntreville Road~~ US 29	Prince William County Line	2	2	4	6	~~2025~~ 2023
VDOT	Primary	Widen	VA 123	US 1	Annapolis Way	2	2	4	6	2025

Source: Visualize 2045, National Capital Area Transportation Planning Board, 2020

Table 6 Continued

Agency / County	Corridor Type	Improvement	Facility	From	To	Facility		Lanes		Complete Date
						Fr	To	Fr	To	
VDOT										
Primary										
VDOT	Primary	Widen	VA 123 Ox Road	Hooes Rd.	Fairfax Co. Parkway	2	2	4	6	~~2025~~ 2030
VDOT	Primary	Widen	VA 123 Ox Road	Fairfax Co. Parkway	Burke Center Parkway	2	2	4	6	~~2025~~ 2030
VDOT	Primary	Widen	VA 123	Burke Center Parkway	Braddock Road	2	2	4	6	~~2025~~ 2030
VDOT	Primary	Widen	VA 123	VA 677 Old Courthouse Road	VA 7 Leesburg Pike			4	6	~~2025~~ 2030
VDOT	Primary	Widen	VA 123 Chain Bridge Road	VA 7 Leesburg Pike	I 495 Capital Beltway	2	2	6	8	~~2025~~ 2030
VDOT	Primary	Upgrade	VA 123	I-495 Capital Beltway	VA 267 Dulles Access Road	3	3	6	6	2030
VDOT	Primary	Widen	VA 123	VA 267 Dulles Access Road	VA 634 Great Falls Street	2	2	4	6	2030
VDOT	Primary	Convert	VA 286 Fairfax County Parkway HOV	VA 267 Dulles Toll Road	Sunrise Valley Drive	5	5	6	4+2	2035
VDOT	Primary	Widen/Upgrade	VA 286 Fairfax County Parkway HOV	VA 7735 Fair Lakes Parkway	I 66	2	5	6	6+2	2035
VDOT	Primary	Widen	VA 286 Fairfax County Parkway	US 29	~~VA 123 Ox Road~~ Rolling Rd.	5	5	4	6	~~2025~~ 2030
VDOT	Primary	Construct	VA 289 Franconia-Springfield Parkway HOV	VA 286 Fairfax County Parkway	VA 2677 Frontier Drive	5	5		2	2025

Source: Visualize 2045, National Capital Area Transportation Planning Board, 2020

Table 7: Visualize 2045 Transit Airport Ground Access Projects

Scenario	Agency / County	Improvement	Facility	From	To	Complete Date
MDOT/MTA						
MARCFRQ	MDOT / MTA	Implement	Penn Line Service Improvements			2029
Montgomery County						
MCT7	Montgomery Co.	Construct	Olney Transit Center	Adjacent to or north of MD 108		2045
VDOT						
MWAYBRT	VDOT	Construct	Crystal City/Potomac Yard Busway (2 lane- dedicated)	Vicinity of Glebe Road Extended (City/County Line)	Pentagon City Metro Station	Complete
	VDOT	Construct	Crystal City Transitway: Northern Extension - complete dedicated lanes	Crystal City Metro Station	Army Navy Drive Transit Station (Army Navy Dr halfway between Hayes St and Joyce St)	~~2021~~ 2022
MWAYEXT2	VDOT	Construct	Crystal City Transitway: Southern Extension - complete dedicated	South Glebe Road	Alexandria city line	2025
MWAYROW	VDOT	Construct	Crystal City/Potomac Yard Transitway- realign with dedicated	East Glebe Road	Evans Lane	2030
SILVER 2	VDOT	Construct	Dulles Corridor Metrorail	Wiehle-Reston East Station	~~VA 772~~ Ashburn Station	2020
SILVER 2	VDOT	Construct	Park-and-Ride Garage	Herndon-Monroe Station		2020
SILVER 2	VDOT	Construct	Park-and-Ride Garage	Innovation Station		2020
VANDBRT	VDOT	Construct	West End Transitway (City Funded)	Van Dorn Street Metro	Pentagon & Landmark	~~2024~~ 2026

Source: Visualize 2045, National Capital Area Transportation Planning Board, 2020

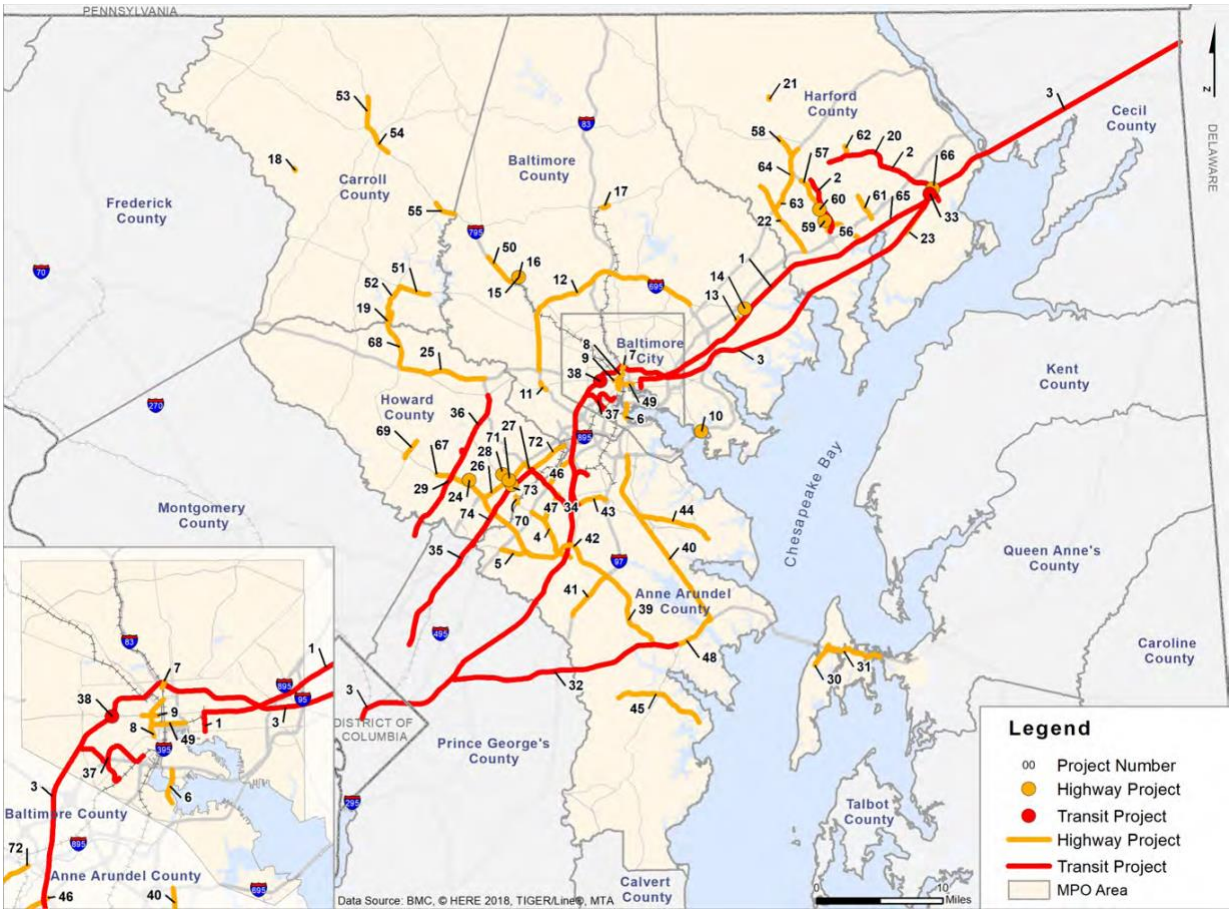
MAXIMIZE2045, BALTIMORE METROPOLITAN COUNCIL (BMC)

Maximize2045 is a regional long-range transportation plan that seeks to make the best use of—or maximize—the resources that make up and support the Baltimore region's transportation system. Maximize2045 contains a list of major capital transportation projects totaling $12 billion, which the region expects to implement from 2024 to 2045.

This section highlights critically important roadway and transit improvements within Maximize2045 that are relevant to BWI, DCA, and/or IAD Airport connectivity.

In addition to the airport ground access-related capital projects to be supported with federal funds which are outlined in Figure 42 and in the tables following, BWI planning staff also emphasized the importance of including the following Maryland Transportation Authority (MDTA) project: I-95: Section 200, ranging from north of MD 43 to north of MD 22 in FY 2026. This project constructs express toll lanes, including MD 152, MD 543, and MD 22 interchanges, adding capacity to a length section of I-95 from White Marsh northward for 18 miles.

Figure 42: Locations of Major Capital Projects, FY 2024-2045



Source: Maximize 2045, Baltimore Metropolitan Council

Table 8: Maximize2045 Major Capital Airport Ground Access Projects, 2024-2034

Map ID	Agency / Jurisdiction	Project Type	Project Timeframe	Project Name	Limits / Length	Description	Justification	Estimated Cost (YOE)
3	MDOT MTA; Regional	Transit	FY 2024-2034	MARC Service	Northern Virginia to Philadelphia	Fill Northeast Corridor commuter rail gap by providing commuter rail service between Perryville, MD and Newark, DE. Provide additional service to Harford County, including reverse commute, late evening service, and weekend service.	Improve service and mobility for current and future riders by addressing capacity, frequency, and reliability.	$21,000,000
4	MDOT MTA; Anne Arundel County	Roadway	FY 2024-2034	MD 175	MD 295 to MD 170; 5.2 miles	Widen from 4 to 6 lanes; reconstruct MD 175/MD 295 interchange, improve MD 32 interchange, improve pedestrian/ bicycle facilities.	Support growth of cyber-security activities at Fort Meade by relieving congestion with added travel lanes, improving traffic operations with access controls in the form of a center median, and supporting multimodal access to major employment hub with extensive pedestrian and bicycle facilities.	$185,000,000
6	Baltimore City	Roadway	FY 2024-2034	Hanover Street Bridge over Middle Branch	Reedbird Ave. to McComas St.; 0.5 miles	Replace existing 1916 Hanover Street Bridge over Middle Branch.	Improve access to jobs, amenities, and wider range of transportation modes: transit, bicycling, walking. Improve access to disadvantaged communities and to Port Covington development. Land use changes might bring destinations closer and increase property values. Provide operating cost and time savings to passengers, freight carriers, and shippers. Provide for smoother roadway with updated signings and markings. Improve safety: reduce fatalities, injuries, crash costs, and hazmat releases.	$255,000,000

Source: Maximize2045, Baltimore Metropolitan Council

Table 8 Continued

Map ID	Agency / Jurisdiction	Project Type	Project Timeframe	Project Name	Limits / Length	Description	Justification	Estimated Cost (YOE)
`12	MDOT SHA; Baltimore County	Roadway	FY 2024-2034	I-695	I-70 to MD 43; 18.9 miles	Create new lane of traffic along inside shoulder of inner and outer loops during peak hours. Ramp metering and reconfiguration of I-695 / I-70 interchange.	Capacity improvements will support mobility and infrastructure stability for adjacent communities and greater Baltimore region.	$350,000,000
26	MDOT SHA; Howard County	Roadway	FY 2024-2034	I-95	MD 32 to MD 100; 6 miles	Create peak hour shoulder use.	Relieve congestion and improve freight movement by adding one outside lane in both directions during peak hours. Creating additional merge area at MD 100 and MD 32 entrance ramps will increase safety.	$41,000,000
27	MDOT SHA; Howard County	Roadway	FY 2024-2034	MD 100	I-95 to Anne Arundel County line; 2 miles	Widen MD 100 from 4 to 6 lanes with auxiliary merge/diverge lanes.	MD 100 (east of I-95) daily, especially during peak periods, experiences congestion that negatively effects commuter, freight/commercial, and regional traffic as well as air quality and energy use. Local traffic diverts to local road network with commensurate negative effects. Widening MD 100 east of I-95 will relieve these problems and accommodate progressively increasing demand for this highway. Prior investment for initial MD 100 construction will be positively augmented by further needed.	$36,000,000

Source: Maximize2045, Baltimore Metropolitan Council

Table 9: Maximize2045 Major Capital Airport Ground Access Projects, 2045-2045

Map ID	Agency / Jurisdiction	Project Type	Project Timeframe	Project Name	Limits / Length	Description	Justification	Estimated Cost (YOE)
33	MDOT SHA; Harford County	Transit	FY 2035-2045	Aberdeen MARC Station	U.S. 40 at MD 132 / Bel Air Rd.	Transit Oriented Development (TOD); new train station, additional parking, U.S. 40 "Green Boulevard," and Station Square Plaza - new pedestrian underpass and green, terraced plaza/amphitheater.	Improve service and mobility for current and future riders by addressing capacity, frequency, and reliability.	$70,000,000
34	TBD Howard County	Transit	FY 2035-2045	Bus Rapid Transit to BWI Airport	Dorsey MARC Station to BWI Light Rail Station; 9.7 miles	New bus rapid transit service: Dorsey MARC station to Arundel Mills to BWI consolidated rental car facility to BWI light rail station.	Link Baltimore and Washington regions more closely together to enable greater economic, housing, educational, and cultural opportunities in each region. Address peak hour congestion. Provide an effective linkage between Camden MARC line and BWI Airport.	$449,000,000
39	MDOT SHA; Anne Arundel County	Roadway	FY 2035-2045	I-97	MD 32 to U.S. 50/301; 6.5 miles	Add managed lanes (HOV lanes) to address capacity needs. Investigate need for additional interchange access in Crownsville.	I-97 provides a gateway to the City of Annapolis and Eastern Shore. Bottlenecks occur on roadway (not just during summer season, but year-round). Project will support U.S. 50/301 improvements (Bay Bridge).	$391,000,000
40	MDOT SHA; Anne Arundel County	Roadway	FY 2035-2045	MD 2	U.S. 50 to I-695; 17 miles	Widen 4-lane sections to 6 lanes throughout. Roadway improvements, new premium transit service, new sidewalks, and permitting land use densities that support transit in select locations where redevelopment might occur.	Corridor serves both local traffic and long-distance commuter traffic destined for downtown Baltimore in the Annapolis, Severna Park, Pasadena, and Glen Burnie areas.	$299,000,000
41	MDOT SHA; Anne Arundel County	Roadway	FY 2035-2045	MD 3	MD 424 to MD 32; 4 miles	Widen from 4 to 6 lanes from St. Stephen Church Road to MD 175. Upgrade roadway segments, improve bike / pedestrian facilities (especially crossings), and improve intersection operations.	Reduce congestion on MD 3, thus improving air quality and reducing greenhouse gases. Improve access to Prince George's County, Fort Meade, and BWI. Project will benefit a significant amount of truck traffic on MD 3. Also, project serves Crofton and Davidsonville areas, where there is a considerable amount of retail and residential activity, including new Waugh Chapel Village.	$120,000,000

Source: Maximize2045, Baltimore Metropolitan Council

Table 9 Continued

Map ID	Agency / Jurisdiction	Project Type	Project Timeframe	Project Name	Limits / Length	Description	Justification	Estimated Cost (YOE)
43	MDOT SHA; Anne Arundel County	Roadway	FY 2035-2045	MD 100	Howard County line to I-97; 6.5 miles	Widen from 4 to 6 lanes. Possible inclusion of managed lanes.	1. The Yellow Line Light Rail Study utilized part of median to run the train. 2. This is a major route connecting Howard County, Anne Arundel County, Arundel Mills and the BWI Airport. 3. Connects Anne Arundel and Howard counties. 4. Connectivity to I-9	$271,000,000
46	MDOT SHA; Anne Arundel County	Roadway	FY 2035-2045	MD 295	MD 100 TO I-195; 3.3 miles	Widen from 4 to 6 lanes. Includes a new interchange at Hanover Road and an extension of Hanover Road from the CSX railroad tracks to MD 170.	Support economic growth at BWI Airport. Relieve congestion and improve freight movement by adding one lane in both directions. Develop a key component of local network with Hanover Road interchange and extension.	$331,000,000
47	MDOT SHA; Anne Arundel County	Roadway	FY 2035-2045	MD 713 (Ridge Rd.)	MD 175 to MD 176; 2.6 miles	Corridorwide road improvements, including reconstruction and widening, as well as intersection improvements and bike/pedestrian accommodations. Primarily widening MD 713 from 2 to 4 lanes between MD 175 and Stoney Run Drive.	Ridge Road corridor parallels the Baltimore-Washington Parkway and connects public facilities and activity centers with residential areas. Pedestrian and bicycle accommodations among residential areas and activity centers are limited and not constructed to county/state standards. County expects growth in employment and population from planned and future developments along or near MD 713 to result in increased travel demand and recurring congestion. Purpose of MD 713 planning study is to identify year 2040 deficiencies, evaluate build alternatives to address deficiencies, reduce current and forecasted congestion, reduce crash potential, and improve pedestrian and bicycle compatibility, while minimizing impacts to natural and built environment.	$60,000,000

Source: Maximize2045, Baltimore Metropolitan Council

IV. RECOMMENDATIONS

The airports, through the Aviation Technical Subcommittee, should continue to work together and in consultation with the TPB to and BMC to identify programs, projects, and policies that support airport ground access needs. This will help ensure that the region's long-range transportation planning efforts continue to address the needs of airport ground access and acknowledge the importance of the airports to the region's economy.

Given how critically important the region's three major commercial airports are to the economic vitality of the Washington-Baltimore region, it is recommended that the projects, programs, and policies identified here be given priority consideration for implementation. The previous section identified airport ground access-supporting projects proposed in the regional long-range transportation plans of TPB and BMC. Based on a review of these projects and in consideration of anticipated airport demand documented in this Regional Air System Plan, the following project are deemed critical to accommodate current and growing airport ground access demand, and thus should be prioritized.

Implementing these projects supports a robust regional air system and helps the Washington-Baltimore air system planning area achieve the federal MPO planning factors, goals, strategies, and aspirational initiatives contained in the TPB and BMC regional long-range planning documents - Visualize 2045 and Maximize2045, respectively - referenced below.

VISUALIZE 2045 PROJECT RECOMMENDATIONS: MAA AND MWAA

MDOT Interstate Roadway Project
Of all recommendations made, only the following project was identified by both MAA and MWAA.

- **Construct/Widen I-495 Toll Lanes**
  - From Virginia State line / Potomac River (including American Legion Bridge) to I-270Y
  - From 8/10 lanes to 8/10 + 4 ETL
  - Completion date: 2025

VISUALIZE 2045 PROJECT RECOMMENDATIONS: MAA

MDOT Interstate Roadway Projects
The following recommendations will help improve access from Virginia to Maryland.

- **Construct/Widen I-270 Toll Lanes**
  - From I-495 to I-270Y
  - From 4 + 2 HOV lanes to 4 + 2 HOV + 4 ETL
  - Completion date: 2025

- **Construct/Widen I-270 Toll Lanes**
  - From I-270Y to I-370
  - From 10 + 2 HOV lanes to 10 + 2 HOV + 4 ETL
  - Completion date: 2025

- **Construct/Widen I-495 Toll Lanes**
  Note: this project was identified by <u>both</u> MAA and MWAA
  - From Virginia State line / Potomac River (including American Legion Bridge) to I-270Y
  - From 8/10 lanes to 8/10 + 4 ETL
  - Completion date: 2025

- **Construct/Widen I-495 Toll Lanes**
  - From I-270Y to MD 355
  - From 6 lanes to 6 + 4 ETL
  - Completion date: 2025

- **Construct/Widen I-495 Toll Lanes**
  - From MD 355 to I-95
  - From 8 lanes to 8 + 4 ETL
  - Completion date: 2025

- **Construct/Widen I-495 Toll Lanes**
  - From I-95 to Baltimore Washington Parkway
  - From 8 lanes to 8 + 4 ETL
  - Completion date: 2025

- **Construct/Widen I-495 Toll Lanes**
  - From I-95 to Baltimore Washington Parkway
  - From 8 lanes to 8 + 4 ETL
  - Completion date: 2025

- **Construct/Widen I-495 Toll Lanes**
  - From Baltimore Washington Parkway to Glenarden Parkway
  - From 8 lanes to 8 + 4 ETL
  - Completion date: 2025

Anne Arundel County Primary Roadway Projects
The following recommendations will reduce congestion in Anne Arundel County surrounding BWI.

- **Widen I-295**
  - From I-195 to MD 100
  - From 4 lanes to 6
  - Completion date: 2035

- **Widen MD 713**
  - From MD 175 to Stoney Run Drive
  - From 2 lanes to 4
  - Completion date: 2040

Visualize 2045 – Howard County Primary Roadway Projects
The following recommendations will reduce congestion in Howard County surrounding BWI.

- **Widen I-95 peak period shoulder use**
  - From MD 32 to MD 100
  - From 4 lanes to 4 + 1
  - Completion date: 2035

- **Widen MD 100**
  - From I-95 to Anne Arundel/Howard County line, River Road
  - From 2 lanes to 4
  - Completion date: 2035

Transit Airport Ground Access Project
The following recommendation will help improve multimodal connectivity to BWI.

- **Implement Penn Line Service Improvements**
  - Completion date: 2029

VISUALIZE 2045 PROJECT RECOMMENDATIONS: MWAA

In addition to the Visualize 2045 project recommendations outlined below, MWAA also shared a more aspirational recommendation not yet contained in either Visualize 2045 or Maximize2045: improved connectivity from the I-95 south of I-495 to IAD Airport. Such an undertaking would likely consist of a multiphase project spanning over several years.

MDOT Interstate Roadway Project
The following recommendation will improve access from Maryland to Virginia.

- **Construct/Widen I-495 Toll Lanes**
  Note: this project was identified by both MAA and MWAA
  - From Virginia State line / Potomac River (including American Legion Bridge) to I-270Y
  - From 8/10 lanes to 8/10 + 4 ETL
  - Completion date: 2025

VDOT Interstate Roadway Projects
The following recommendations will help reduce congestion along I-66.

- **Widen/Revise Operations of I-66**
  - From I-495 to US 50
  - From 3 general purpose in each direction + 1 HOV in peak direction during peak period to 3 general purpose + 1 Auxiliary + 2 HOT each direction
  - Completion date: 2021

- **Widen/Revise Operations of I-66**
  - From US 50 to US 29 Centreville
  - From 4 general purpose lanes in each direction off-peak, 3 general purpose + 1 HOV in peak direction during peak period to 3 general purpose lanes + 1 Auxiliary + 2 HOT lanes in each direction (2 Aux per direction between VA 286 & VA 28 only)
  - Completion date: 2021

- **Widen/Revise Operations of I-66**
  - From US 29 Centreville to University Boulevard Ramps (which is a new interchange for HOT-only)
  - From 4 general purpose lanes in each direction off-peak, 3 general purpose + 1 HOV in peak direction during peak period to 3 general purpose + 2 HOT in each direction
  - Completion date: 2021

- **Widen/Revise Operations of I-66**
  - From VA 234 Bypass to University Boulevard
  - From 4 general purpose in each direction off-peak, 3 general purpose + 1 HOV in peak direction during peak period to 3 general purpose+ 2 HOT in each direction (+1 Auxiliary each direction between US 29 and VA 234 Bypass only)
  - Completion date: 2021

- **Widen/Revise Operations of I-66**
  - From University Blvd Ramps (new interchange; HOT-only) to US 15 (1.2 miles west of)
  - From 4 general purpose in each direction off-peak, 3 general purpose + 1 HOV in peak direction during peak period to 3 general purpose + 2 HOT in each direction +1 Auxiliary each direction between US 29 and VA 234 Bypass only
  - Completion date: 2040

- **Widen/Revise Operations of I-66**
  - From I-495 to US 29 near Rosslyn
  - From HOT 2 in peak direction during peak period to HOT 3
  - Completion date: 2021

- **Revise Operations of I-66**
  - From I-495 to US 29 near Rosslyn
  - From HOT 3 in peak direction during peak period to HOT lanes 3 in both directions
  - Completion date: 2040

- **Construct/Widen I-66 Eastbound**
  - From VA 267 Dulles Toll Road to Washington Boulevard Off-Ramp
  - 3 lanes to 4 lanes
  - Completion date: 2020

- **Construct/Widen I-66 Eastbound**
  - From Washington Boulevard Off-Ramp to North Fairfax Drive
  - 2 lanes to 3 lanes
  - Completion date: 2020

- **Construct/Widen I-66 Westbound**
  - From Sycamore Street to Washington Blvd On-Ramp
  - 2 lanes to 3 lanes
  - Completion date: 2040

VDOT Interstate Roadway Projects
The following recommendations will help reduce congestion along the I-495 Capital Beltway.

- **Widen I-495 Capital Beltway SB Auxiliary Lane**
  - From VA 193 On-Ramp to VA 267 Off-Ramp
  - From 4+2 lanes to 5+2 lanes
  - Completion date: 2030

- **Construct I-495 Express Lanes On-Ramp**
  - From Dulles Connector Road Westbound to I-495 Express Lanes Northbound
  - From 0 lanes to 1 lane
  - Completion date: 2025

- **Construct I-495 Capital Beltway HOT Lanes**
  - From American Legion Bridge to George Washington Parkway (south of)
  - From 8 to 8+4 lanes
  - Completion date: 2025

- **Construct I-495 Capital Beltway HOT Lanes**
  - From George Washington Parkway (south of) to Old Dominion Drive (south of)
  - From 8 to 8+4 lanes
  - Completion date: 2025

- **Construct I-495 Capital Beltway Interchange (Phase IV)**
  - Provide Southbound HOT lanes to Eastbound HOV & Eastbound Dulles Toll Road to Northbound HOT movement at VA 267 Dulles Toll Road
  - Completion date: 2030

- **Widen I-495 Capital Beltway Interchange Ramp (Phase III Dulles Toll Road)**
  - Widen Eastbound Dulles Toll Road ramp to 2 Northbound lanes
  - From 1 to 2 lanes
  - Completion date: 2030

VDOT Interstate Roadway Projects
The following recommendation will help reduce congestion along the Dulles Airport Access Road.

- **Widen Dulles Airport Access Road**
  - From Dulles Airport to VA 123
  - From 4 to 6 lanes
  - Completion date: 2030

VDOT Primary Roadway Projects
The following recommendations will help reduce congestion along VA 28.

- **Widen VA 28 from I-66 to Westfields Boulevard**
  - From I-66 to Westfields Boulevard, as part of VA 28 PPTA Phase II
  - From 6 lanes to 8+ 2 aux lanes
  - Completion date: 2021

- **Widen VA 28 from Westfields Boulevard to US 50**
  - From Westfields Boulevard to US 50, as part of VA 28 PPTA Phase II
  - From 6 lanes to 8 lanes
  - Completion date: 2025

- **Widen VA 28 from US 50 to Sterling Boulevard**
  - From US 50 to Sterling Boulevard, as part of VA 28 PPTA Phase II
  - From 6 lanes to 8 lanes
  - Completion date: 2025

- **Widen VA 28 from Sterling Boulevard to VA 7**
  - From Sterling Boulevard to VA 7, as part of VA 28 PPTA Phase II
  - From 6 lanes to 8 lanes
  - Completion date: 2025

MAXIMIZE2045 PROJECT RECOMMENDATIONS: MAA

MDOT SHA; Baltimore County Roadway Project
The following recommendation creates capacity improvements that will support mobility and infrastructure stability for adjacent communities and the greater Baltimore region.

- **I-695 / I-70 Interchange Reconfiguration**
  - From I-70 to MD 43; 18.9 miles
  - Create new lane of traffic along inside shoulder of inner and outer loops during peak hours. Ramp metering and reconfiguration of I-695 / I-70 interchange.
  - Timeframe: 2024-2034

MDOT SHA; Howard County Roadway Project
The following recommendation will relieve congestion and improve freight movement by adding one outside lane in both directions during peak hours. Creating an additional merge area at MD 100 and MD 32 entrance ramps will also increase safety.

- **I-95 Peak Hour Shoulder Use**
  - From MD 32 to MD 100; 6 miles
  - Create peak hour shoulder use.
  - Timeframe: 2024-2034

MDOT SHA; Howard County Roadway Project
The following recommendation will relieve congestion on MD 100 east of I-95 and the local road network and accommodate progressively increasing demand for this highway.

- **MD 100 Widening**
  - From I-95 to Anne Arundel County line; 2 miles
  - Widen MD 100 from 4 to 6 lanes with auxiliary merge/diverge lanes.
  - Timeframe: 2024-2034

Howard County Transit Project
The following recommendation will link the Baltimore and Washington regions more closely together to enable greater economic, housing, educational, and cultural opportunities in each region while also addressing peak hour congestion and providing an effective linkage between Camden MARC line and BWI Airport.

- **Bus Rapid Transit to BWI Airport**
  - From Dorsey MARC Station to BWI Light Rail Station; 9.7 miles
  - New bus rapid transit service: Dorsey MARC station to Arundel Mills to BWI consolidated rental car facility to BWI light rail station.
  - Timeframe: 2035-2045

MDOT SHA; Anne Arundel County Roadway Project
The following recommendation will make significant improvements to a corridor that serves both local traffic and long-distance commuter traffic destined for downtown Baltimore in the Annapolis, Severna Park, Pasadena, and Glen Burnie areas.

- **MD 2 Widening, Roadway Improvements, New Transit Service and Sidewalks**
  - From U.S. 50 to I-695; 17 miles
  - Widen 4-lane sections to 6 lanes throughout. Roadway improvements, new premium transit service, new sidewalks, and permitting land use densities that support transit in select locations where redevelopment might occur.
  - Timeframe: 2035-2045

MDOT SHA; Anne Arundel County Roadway Project
The following recommendation will reduce congestion on MD 3 and improve access to Prince George's County, Fort Meade, and BWI. The project will benefit a significant amount of truck traffic on MD 3. Additionally, the project serves Crofton and Davidsonville areas, where there is a considerable amount of retail and residential activity, including new Waugh Chapel Village.

- **MD 3 Widening, Roadway Upgrades, Improvements to Bike/Pedestrian Facilities and Intersection Operations**
  - From MD 424 to MD 32; 4 miles
  - Widen from 4 to 6 lanes from St. Stephen Church Road to MD 175; upgrade roadway segments; improve bike / pedestrian facilities (especially crossings); and improve intersection operations.
  - Timeframe: 2035-2045

MDOT SHA; Anne Arundel County Roadway Project
The following recommendation will connect Anne Arundel and Howard Counties, as well as enhance connectivity to BWI Airport, I-9, and Arundel Mills.

- **MD 100 Widening**
  - From Howard County line to I-97; 6.5 miles
  - Widen from 4 to 6 lanes. Possible inclusion of managed lanes.
  - Timeframe: 2035-2045

MDOT SHA; Anne Arundel County Roadway Project
The following recommendation will support economic growth at BWI Airport; relieve congestion and improve freight movement by adding one lane in both directions; and develop a key component of the local network with the Hanover Road interchange and extension.

- **MD 295 Widening and Interchange Development**
  - From MD 100 TO I-195; 3.3 miles
  - Widen from 4 to 6 lanes. Includes a new interchange at Hanover Road and an extension of Hanover Road from the CSX railroad tracks to MD 170.
  - Timeframe: 2035-2045

FEDERAL MPO PLANNING FACTORS

- Increase accessibility and mobility of people and freight.
- Enhance the integration and connectivity of the transportation system, across and between modes, for people and freight.
- Enhance travel and tourism.

TPB VISUALIZE 2045 POLICY FRAMEWORK

Aspirational Initiatives

The express travel network would provide several benefits for airport ground access connectivity, including reducing congestion and incentivizing travelers to either carpool or travel by transit vehicle. Expanding Metrorail capacity would increase logistical ease and comfort for those traveling by Metrorail to and from airports.

Regional Transportation Priorities Plan (RTPP) Goals

- Provide a comprehensive range of transportation options.
- Support inter-regional and international travel and commerce.

BMC MAXIMIZE2045 POLICY FRAMEWORK

Regional Transportation Goals and Strategies

- **Improve and maintain the existing infrastructure**
  - Continue to improve the condition of roadways systems, transit infrastructure and stations.

- **Improve accessibility**
  - Improve system connectivity and continuity among all modes and across inter-jurisdictional and inter-regional boundaries, including coordination of transit planning and investment and consideration of a regional transit fare system.

- **Increase mobility**
  - Balance capacity in the highway, transit, and freight rail systems and pedestrian and bicycle networks, including the consideration of expanded transit service coverage and hours of operation.

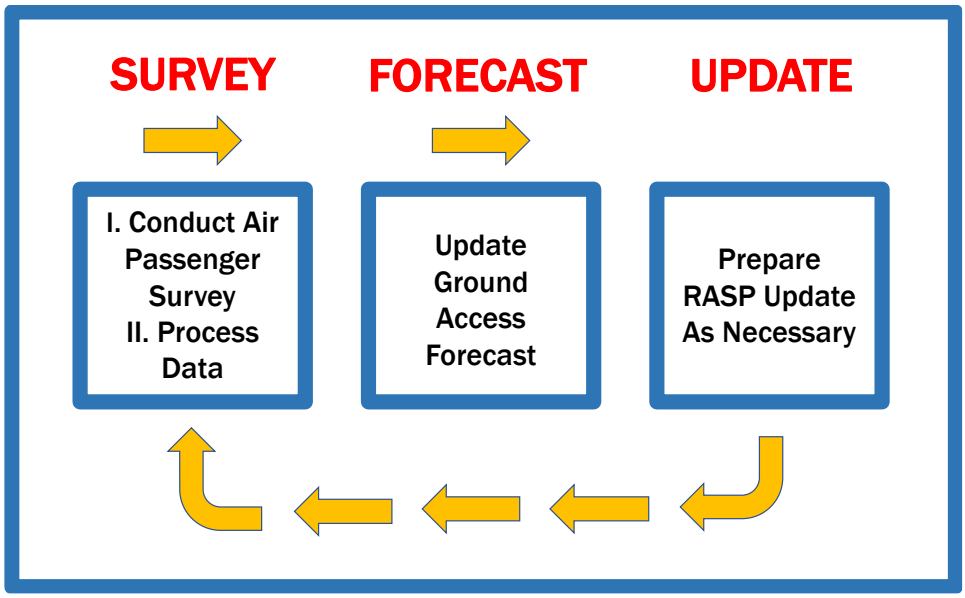
- **Promote prosperity and economic opportunity**
  - Coordinate transportation investments with state and local plans regarding growth and development.

- **Promote informed decision making**
  - Coordinate transportation planning and programs across all modes, across inter-jurisdictional and inter-regional boundaries, and among all stakeholders as appropriate and feasible to provide affordable, reliable, safe, and secure transportation alternatives.

V. NEXT STEPS

To ensure regional aviation ground access needs and goals are addressed in the regional transportation planning process, the CASP planning cycle is synchronized with the regional Long-Range Transportation Plan (LRTP) update process. In general, the airport system planning process consists of a continuous cycle that begins with a regional air passenger survey, as shown in the figure below. This survey is followed by forecasts of future air passenger travel and ground travel of these air passengers to and from the region's three commercial airports. These forecasts in turn lead to the development of a revised ground access plan for the region. The RASP Update is the synchronizing mechanism that links airport ground access needs to regional transportation planning. It is also the final and concluding step in the planning cycle. The 2021 Washington-Baltimore Reginal Air Passenger Survey will be the starting point of the next cycle. The precise timing of future RASP Updates will be based on need as well as aligning with each airport's strategic and master planning processes.

Figure 43: Washington-Baltimore CASP Cycle



Source: National Capital Area Transportation Planning Board, 2020

VI. CONCLUSION

For the first time since 1975, the Washington-Baltimore regional air system has produced a comprehensive RASP. Through the multiyear, three phase process conducted, this report equips planning staff and policymakers alike with a holistically updated understanding of the state of the air system and how best to advance the region's need for improved airport ground access connectivity.

Phase 1 provided an exhaustive review of early to recent air system planning efforts throughout the region, providing a baseline understanding of the conditions under which each airport, and the air system region as a whole, operates today. Concurrently, the national literature review conducted helped inform a complete picture of the state of the practice in regional air system planning. These tasks combined informed the specific areas of assessment outlined in Phase 2.

Phase 2 reviewed existing conditions (supply) and anticipated needs (demand) in the regional air system. As a result, all three participating airports identified the overarching need for future, more detailed and dynamic ground access studies for their respective facilities. Planning staff from each airport emphasized that the exercise of reporting key supply and demand-based metrics covering the range of their facility's operations was useful and recognize that future RASP updates will be crucial in improving their overall system performance.

Phase 3 consisted of five key parts, beginning with a comprehensive set of planning considerations that relate to the region's entire air system. From there, a needs assessment was conducted with the three airports, which aligned with the Phase 3 supply and demand assessment metrics. The ground access element update provided context for the latest ground access forecast, along with highlighting long-range transportation projects that have relevance to airport ground access.

Overall, the ground access element update demonstrates that long-term demand for airports will continue to grow and therefore it is necessary to plan for that growth from now through 2045. However, at the time of this report's completion, the COVID-19 global pandemic has significantly impacted the aviation industry. While it is too soon to tell what the full range of implications will be, two conclusions can be drawn: 1) airports are experiencing a significant short-term decline in air travel demand and 2) moving forward, enplanement and thus ground access forecasts must also factor in the potential for global pandemics and other health-related risks.

To keep up with the industry's long-term forecasted growth, both MWAA and MAA are investing hundreds of millions of dollars through their AIPs and other capital improvements to support these growing numbers of travelers. Such improvements include the widening of access roads to and at the terminals. Such considerations lead naturally into the report's recommendations, which focus primarily on policymakers prioritizing key airport ground access-related projects, policies and programs within the TPB and BMC long-range transportation plans in the years ahead.

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